

CAMBRIDGE PRIMARY Science

Learner's Book

3



Jon Board and Alan Cross

Completely **Cambridge**
Cambridge resources
for
Cambridge qualifications

CAMBRIDGE PRIMARY **Science**

Learner's Book



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References to Activities contained in these resources are provided 'as is' and information provided is on the understanding that teachers and technicians shall undertake a thorough and appropriate risk assessment before undertaking any of the Activities listed. Cambridge University Press makes no warranties, representations or claims of any kind concerning the Activities. To the extent permitted by law, Cambridge University Press will not be liable for any loss, injury, claims, liability or damage of any kind resulting from the use of the Activities.



Introduction

The *Cambridge Primary Science* series has been developed to match the Cambridge International Examinations Primary Science curriculum framework. It is a fun, flexible and easy-to-use course that gives both learners and teachers the support they need. In keeping with the aims of the curriculum itself, it encourages learners to be actively engaged with the content, and to develop enquiry skills as well as subject knowledge.

This Learner's Book for Stage 3 covers all the content in Stage 3 of the curriculum framework. The topics are covered in the order in which they are presented in the curriculum for easy navigation, but can be taught in any order that is appropriate to you.

Throughout the book you will find ideas for practical activities, which will help learners to develop their scientific enquiry skills as well as introduce them to the thrill of scientific discovery.

The 'Talk about it!' question in each topic can be used as a starting point for classroom discussion, encouraging learners to use scientific vocabulary and develop their understanding.

'Check your progress' questions at the end of each unit can be used to assess learners' understanding. Learners who will be taking the Cambridge Primary Progression test for Stage 3 will find these questions useful preparation.

We strongly advise you to use the Teacher's Resource for Stage 3, ISBN 978-1-107-61150-4, alongside this book. This resource contains extensive guidance on all the topics, ideas for classroom activities, and guidance notes on all the activities presented in this Learner's Book. You will also find a large collection of worksheets, and answers to all the questions from the Stage 3 products.

Also available is the Activity Book for Stage 3, ISBN 978-1-107-61150-4. This book offers a variety of exercises to help learners consolidate understanding, practise vocabulary, apply knowledge to new situations and develop enquiry skills. Learners can complete the exercises in class or be given them as homework.

We hope you enjoy using this series.

With best wishes,
the Cambridge Primary Science team.



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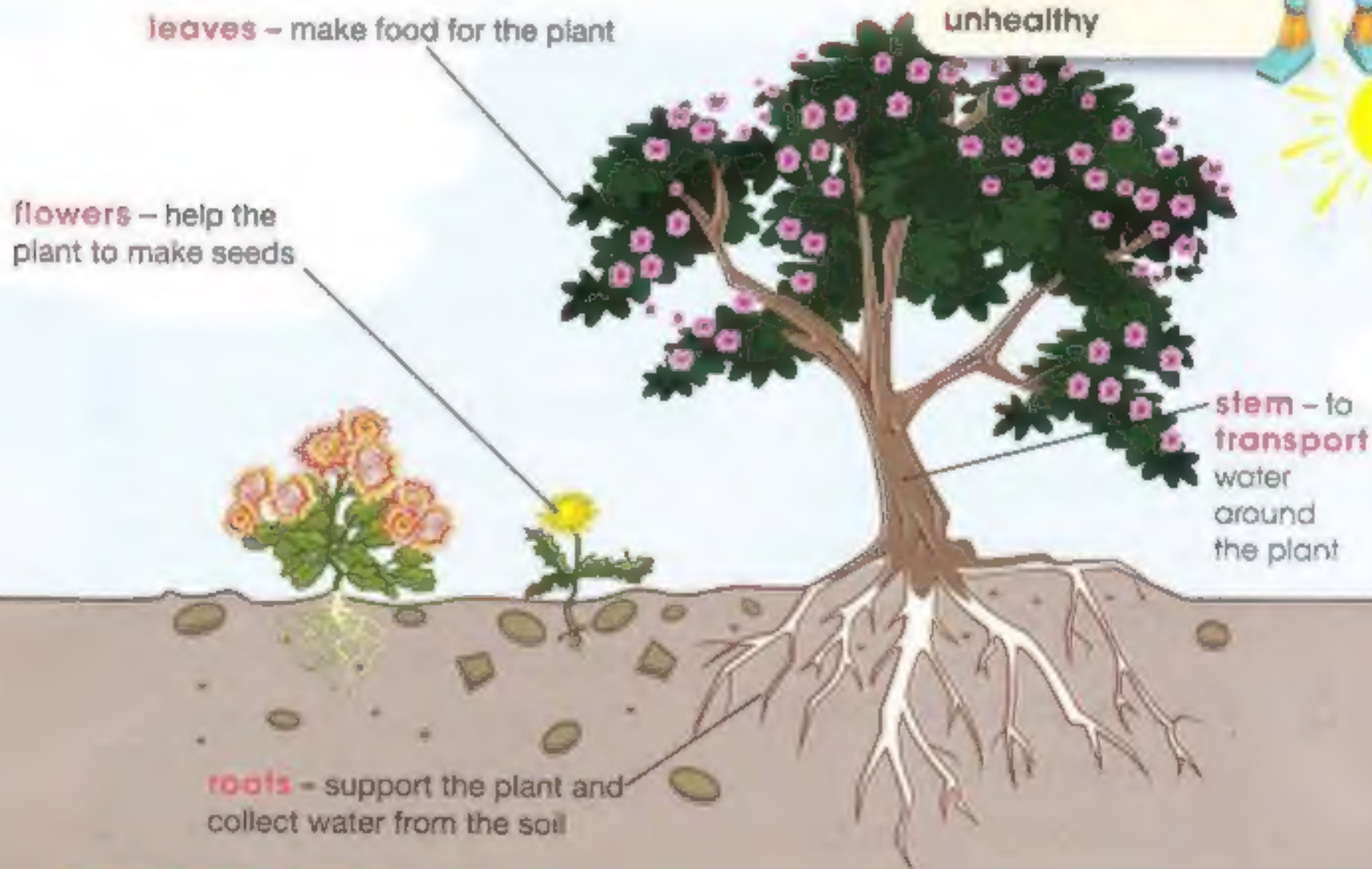
Looking after plants

1.1 Plants and their parts

Plants can look very different.
Most have four main parts.

Words to learn

leaves flowers
stem transport
roots healthy
unhealthy



Activity 1.1

Make a model plant

Make a plant like this one.

Make labels for the stem, roots, leaves and flower. Stick them to your plant.



You will need:

string - straws
coloured paper or card
sticky tape - glue



Healthy leaves.

Healthy plants have healthy roots, stems and leaves.

A plant with **unhealthy** roots, stems and leaves will not grow well.



A plant with healthy roots.



Unhealthy roots with root knot disease.



Unhealthy leaves with rust disease.

Questions

- 1 List **four** things that most plants have.
- 2 Describe how plants are different from each other.

What you have learnt

- ☞ Most plants have roots, a stem, leaves and flowers.
- ☞ Healthy plants have healthy roots, stem and leaves.
- ☞ A plant with unhealthy roots, stem and leaves will not grow well.

Talk about it!

Why don't plants have flowers all year round?

1.2 Plants need light and water



Sunil has an unhealthy plant.

What does a plant need to stay healthy and grow?

Words to learn

predict investigation
fair test wilt
explain



Activity 1.2a

Do plants need light to grow?

Look at the pictures to see what to do.

You will need:

six young plants • watering can • box to cover three plants



Water all the plants every day.

What do you **predict** will happen to the leaves, stems and roots of the plants?

In this **investigation** both groups of plants are given water.

What else do you need to keep the same to make this a **fair test**?

If plants do not get enough light and water the roots, stem or leaves, become unhealthy. The plant will **wilt**.

Light and water both help the plant to make food.

Activity 1.2b

Do plants need water to grow?

Look at the pictures to see what to do.

You will need:

nine young plants · watering can



What do you predict will happen to the plants' leaves, stems and roots in each case?

What do plants need to grow? How do you know?

Explain what you have found out.

Questions

- 1 What does a plant need to grow and stay healthy?
- 2 Explain what happens to the stem and leaves when you put a plant in a dark place.
- 3 Would a plant grow if it was given juice instead of water? Draw a picture to show how you could investigate this.

The surface of the Moon.



Talk about it!

Could plants ever grow on the Moon?

What you have learnt

- 15 All plants need light to grow and keep their stems and leaves healthy.
- 15 All plants need some water to grow and keep their stems and leaves healthy.

Helene has a plant that looks unhealthy
Look at the roots

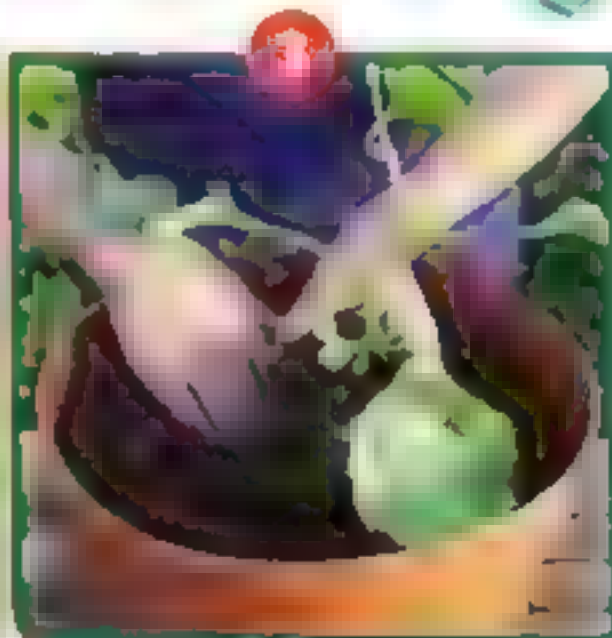
Words to learn
absorb



This pot is too small
for the roots

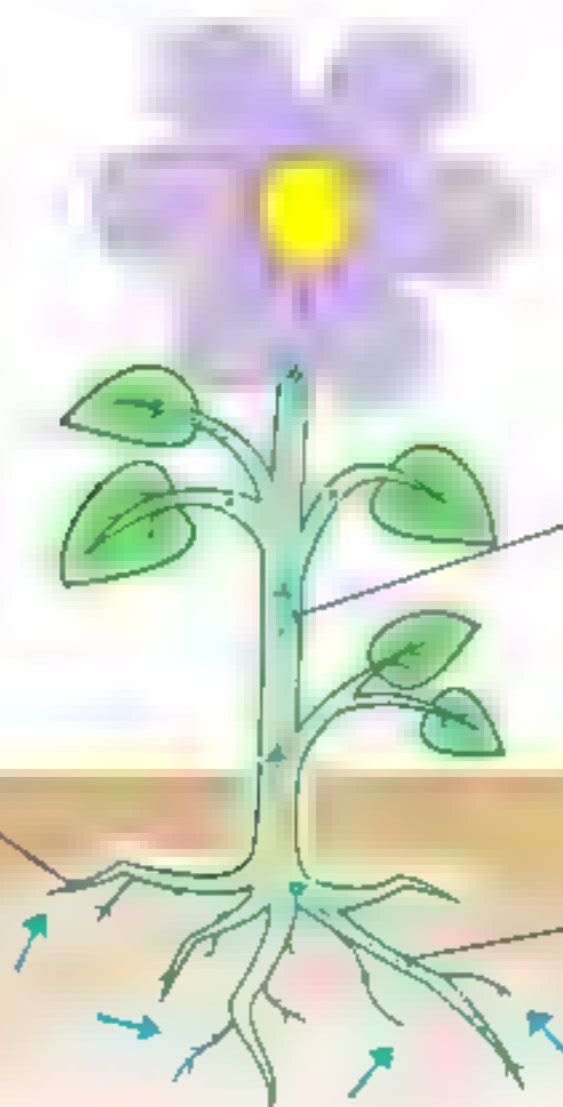


The roots are really close
together and cannot
absorb water well.



Putting the plant in a
bigger pot will allow the
roots to spread out

The roots absorb
water from the soil



The stem transports
water to the leaves
and flowers

The roots transport
water to the stem

Experiment

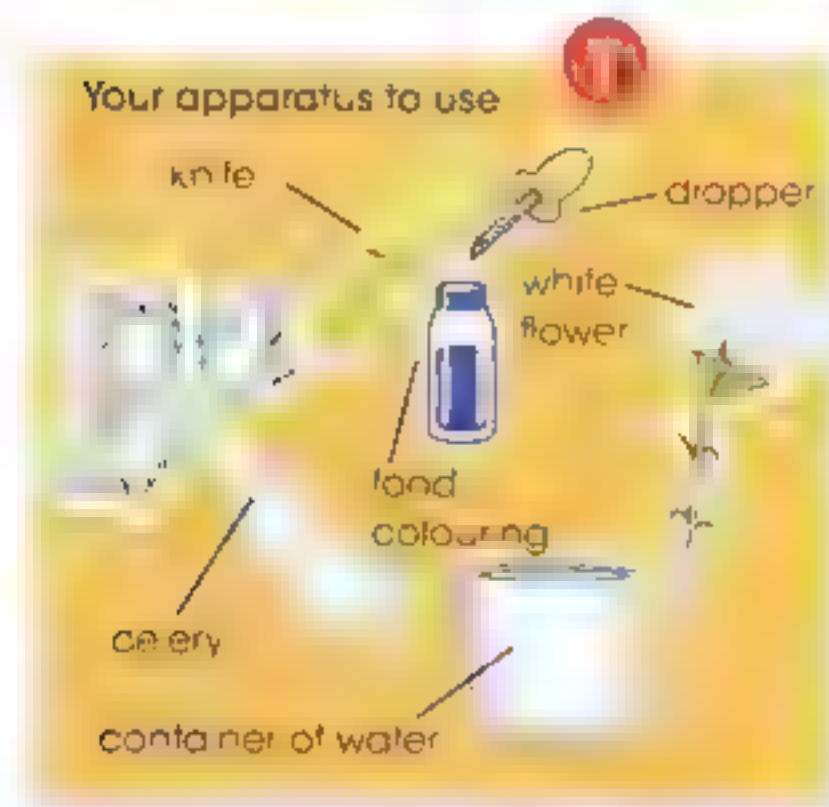
Making plants go blue

You will need:

a white flower some celery a container of water
blue food colouring a plastic knife

A plant stem can transport water to the leaves and flowers

Predict what would happen if the water was blue



After one day, cut the celery and look inside

Can you explain what has happened to the celery and the flower?

Questions

- 1 Why do plants sometimes need to be moved to a bigger pot?
- 2 How do plants get water to their leaves?
- 3 What would happen to a plant with no roots? Why?

What you have learnt

- Roots absorb water from the soil.
- Roots transport water to the stem.
- The stem transports water around the plant.

Talk about it!

What happens to flowers when they are cut and put into water?

Activity 1

You will need:

two similar bean plants • a thermometer • a ruler

Words to learn

thermometer temperature
results bar chart
conclusion



At which temperatures do plants grow best?

Set up an investigation like one of the pictures below



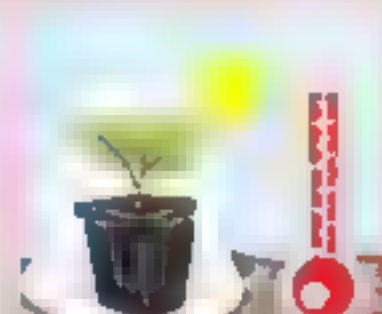
Put one plant in
the classroom



Put one plant
outside in cold
weather.



Put one plant in
the classroom



Put one plant
outside in warm
weather.

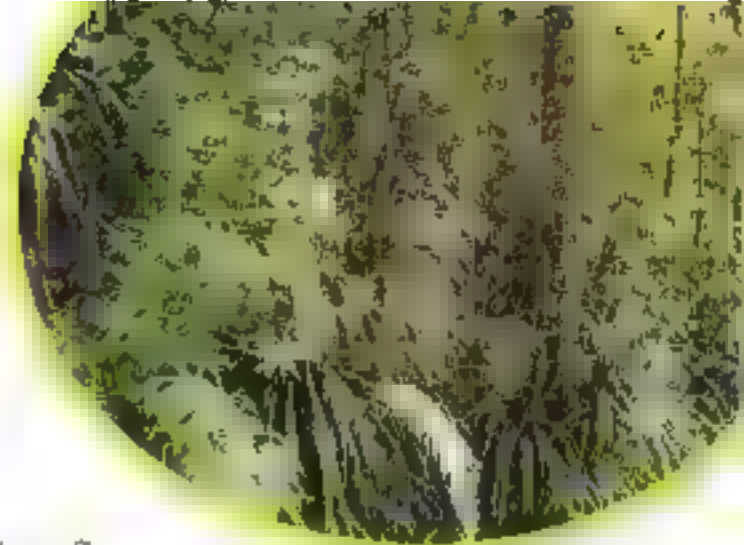
Predict which plant will grow the best. Use a ruler to measure the height of the plants and a thermometer to measure the temperature every few days. Record your results in a table.

Day	Cold/hot plant		Warm plant	
	Temperature in °C	Height in cm	Temperature in °C	Height in cm
1				

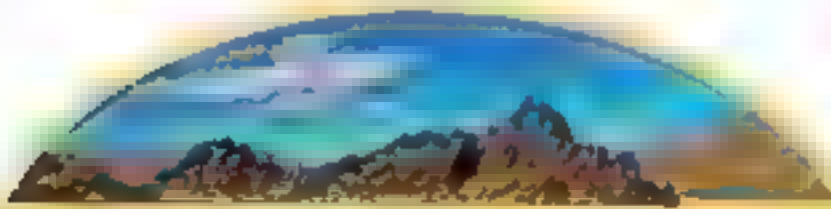
Draw a bar chart to show the height of the plants on the last day. What is your conclusion? At what temperatures do plants grow best?

Think about the place you live. Is there enough warmth for plants to grow?

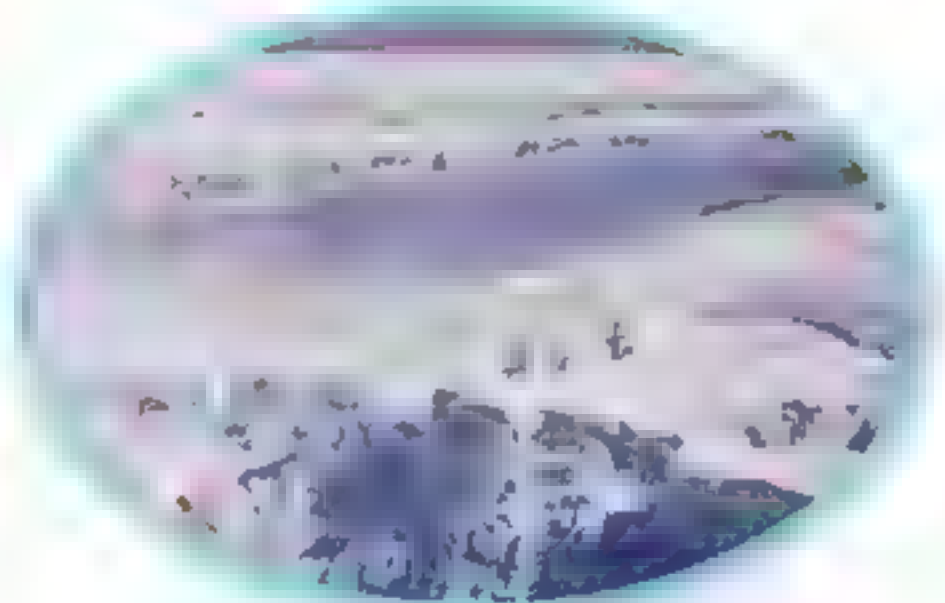
This is a rainforest. Many plants find it easy to grow here. It is warm but not too hot and there is plenty of water.



When is the warmest time of year? When is the coldest? Can plants grow all year?



At over 56°C Death Valley in America is one of the hottest places on Earth.



At -89°C Antarctica is the coldest place on Earth.

Questions

- 1 Where do plants grow best? Cold places, hot places or warm places?
- 2 What happens when a plant gets too hot?
- 3 How is plant growth affected by temperature?

What you have learnt

- _ Plants grow more slowly when it is cold
- _ Plants grow more quickly when it is warm
- _ Plants die when they get too cold or too hot

Talk about it!

Why are there no plants in Death Valley or Antarctica?

Check your progress



Here is a flowering plant.

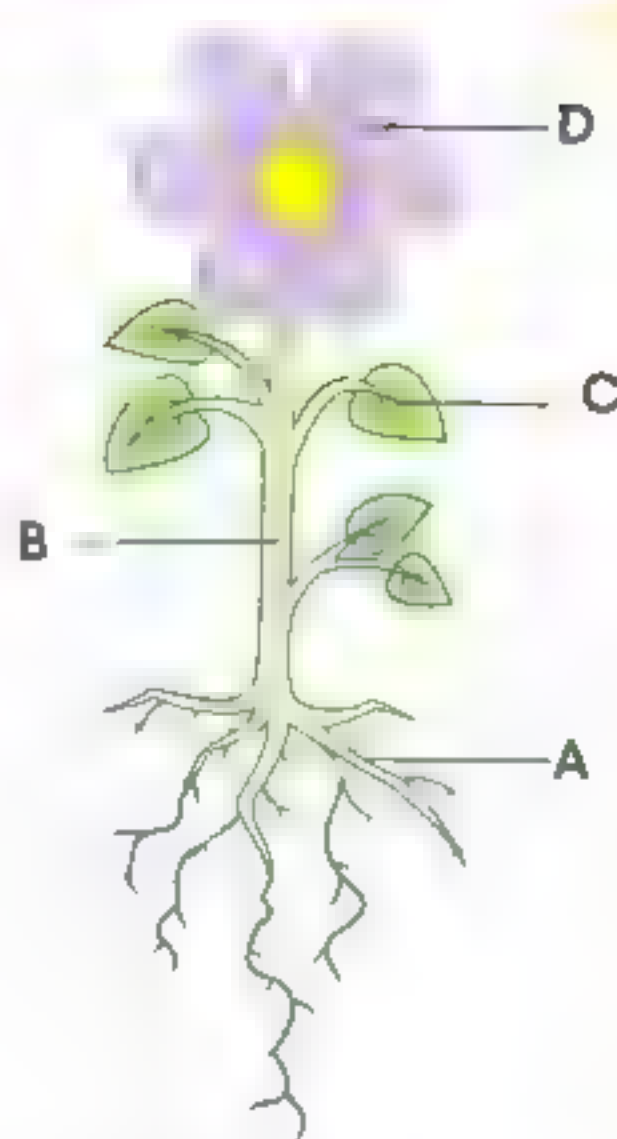
Copy and complete these sentences.

A is the _____

B is the _____

C is a _____

D is the _____



Copy and complete the sentences using the missing words

You may use each word more than once

roots

flowers

stem

leaves

water

Plants have _____ that are under the ground. These hold the plant up and also absorb _____. The water is transported to the _____ and then to the _____ and the _____.

The _____ make food for the plant. The _____ help the plant to make seeds.



Which **two** of these does a plant need for it to grow?



Copy and complete this sentence

A plant needs _____ and _____ to grow



Luz and Cheng have planned an investigation



- a What are they investigating?
- b What do they need to keep the same to make the test fair?
- c Which plant will grow the best?

FOODS AND OUR BODIES

Unit 2: Looking after ourselves

Foods can be put into groups



You need dairy foods for strong bones and teeth

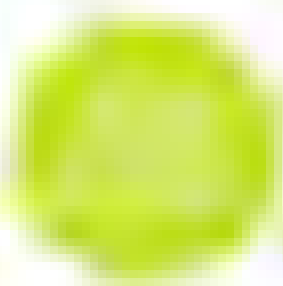


Words to learn

dairy	fruit
vegetables	fat
carbohydrate	energy
protein	meat
fish	



You need fruit and vegetables to be healthy



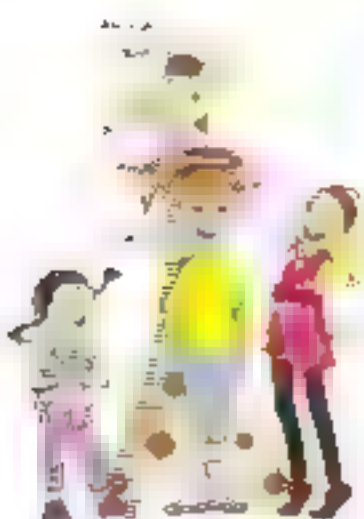
You should not eat too much fat and sugar



You need carbohydrate for energy.



You need protein (such as meat and fish) for growth.



Activity 2.1

Sorting food into food groups

Look at some foods and put them into food groups

Use this book to help you.

The labels on the packets will help.

Bimla wants to be healthy. What should she eat?

You will need:

real or model food - food packaging or
pictures of food - food group name cards

Eat chocolate. Sugar
gives you energy.

Eat food that
tastes good.

Drink milk. It makes
you strong.

Fruit and vegetables
are good for you.



Questions

- 1 Which food group should you eat least? Why?
- 2 Which food group helps you to grow?
- 3 What type of food group would be good to eat as a healthy snack?

What you have learnt

- Food can be put into groups: carbohydrate, fruit and vegetables, protein, dairy, fat

Talk about it!

Which food groups
should you eat most?

2.2 A healthy diet



Words to learn

diet nutrition
headache dehydrated



A healthy **diet** needs to be varied.
A balance of food from different
groups gives your body the
nutrition it needs

This food triangle shows
how much of each food
group you should eat.

Fruit and vegetables keep us healthy. Sam will only eat
bananas and carrots. He does not like any others.

Taste this kiwi fruit.
It's nice.

No, I don't like it.
It's hairy.

Look, it's great inside.

Hmmm.

Fruit and vegetables
are good for you.

It's nice.



Activity 2.2

You will need:

some fruit and vegetables you can taste
disposable spoons

Tasting fruit and vegetables

Talk about the taste of some fruit and vegetables

Which ones will you like? Make a prediction then taste them

Draw a table like this for your results.

Fruit/Vegetable	Prediction	Result	
	Will you like it?	How did it taste?	Did you like it?
melon	no	very sweet	yes

When running long distances it is easy to become dehydrated



Water is part of a healthy diet. Not drinking enough will make you tired and give you a **headache**

This is called being **dehydrated**

We can only live without water for a few days

Questions

- 1 Why do we need to eat lots of fruit and vegetables?
- 2 What makes people dehydrated?

What you have learnt

- A healthy diet gives your body the nutrition it needs.
- A food triangle shows how much of each food group you should eat
- Fruit and vegetables are a very important part of a healthy diet
- We can only live without water for a few days

Talk about it!

Why was it good that Sam tasted the kiwi fruit?

You will need:

some drinks and their labels

Which drinks have the most sugar?

Predict which drinks are healthy and which are unhealthy.
Read the labels to find out how much sugar is in each drink. Record your results in a table.

Words to learn

record salt

discuss



Activity 1.10

What does sugar do to teeth?

You will need:

a drink with lots of sugar · water
egg shells · 2 plastic cups

The material that makes up egg shells is similar to the material that makes up your teeth. Look at the pictures to see what to do. Predict what you think will happen to the egg shells.



Place half an egg shell into each cup.



Add water to one cup and a sugary drink to the other.



After seven days see what has happened to the egg shell.

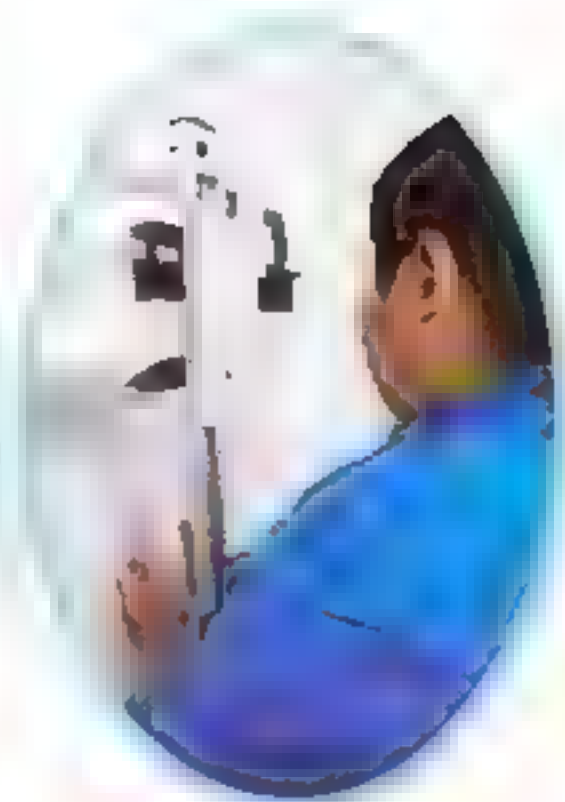
Think about what you found out. Explain what too much sugar can do to your teeth.

Eating lots of fat, sugar and salt makes your diet unhealthy. Fat and salt are bad for your heart.



Sugar is bad for your teeth. Brushing your teeth after breakfast and before going to bed will help.

Eating too much food is bad for you. Your body can store food as fat. This can make you overweight.



Some people do not have enough food to eat. Being very thin is not healthy.



Challenge Is fruit juice good for your teeth? How could you find out? **Discuss** this with your friends.

Questions

Copy and complete these sentences

- 1 Too much sugar is bad for your _____
- 2 Too much fat and salt is bad for your _____

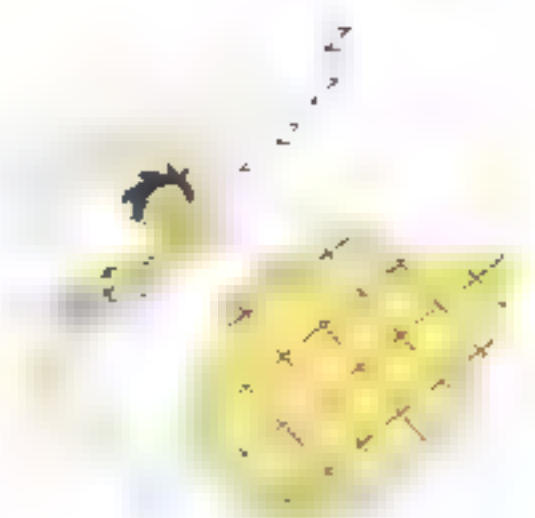
What you have learnt

- Too much fat, salt and sugar in your diet will make you unhealthy.

Talk about it!
Why do we like to eat unhealthy food?



Who is doing exercise in this picture?



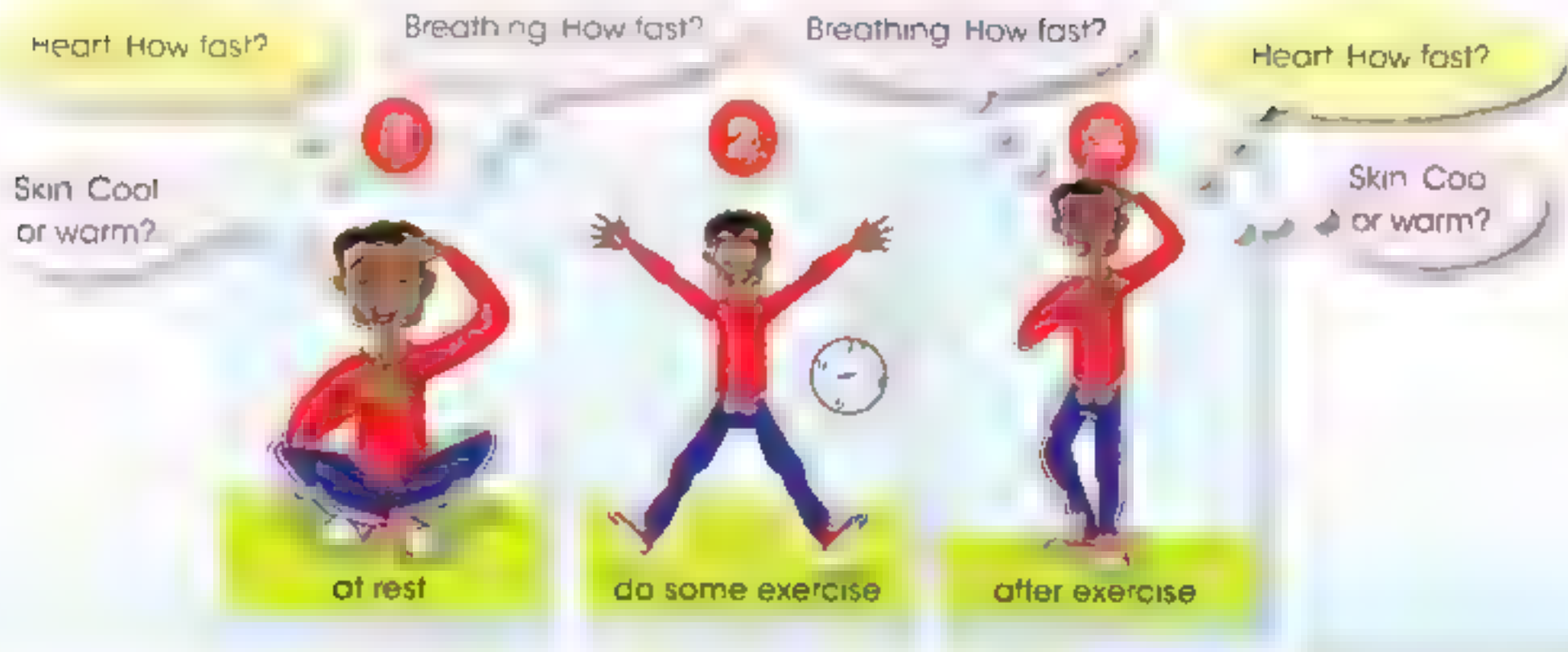
Activity 2.4

You will need:

lots of space stopwatch

What happens when we exercise?

Look at the pictures to see what to do



Challenge Predict what will happen if you exercise for longer

Questions

- Which of these is exercise running, jumping, reading, sleeping, skipping, playing football?
- Copy and complete the sentence Exercise is good for your _____, _____ and _____.

What you have learnt

- Exercise and sleep will help to keep you healthy



Even astronauts have to exercise to keep healthy.

Talk about it!

What is a good time to go to bed?



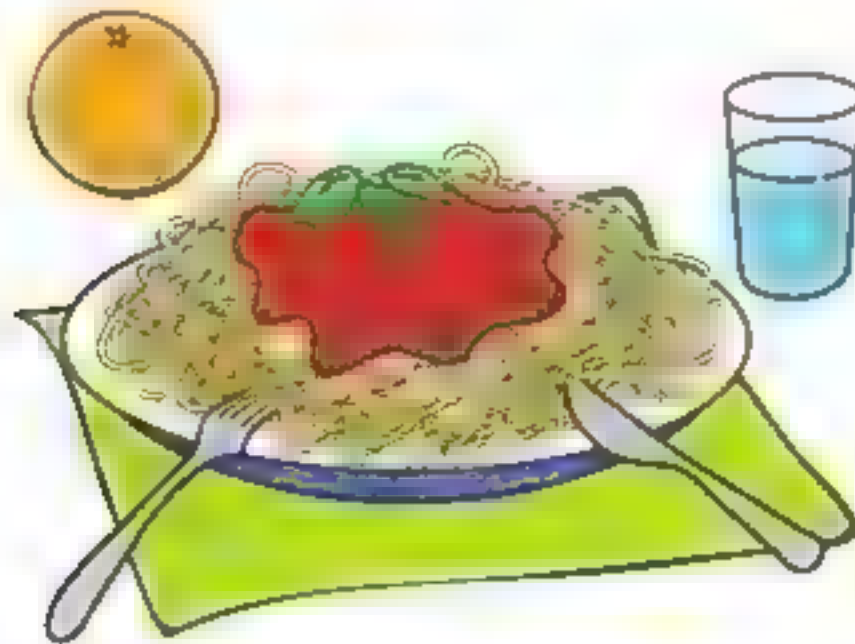
Match the food group with the description

1	dairy
2	carbohydrate
3	fruit and vegetables
4	fat and sugar
5	protein

A	do not eat too much of this
B	gives you energy
C	helps you to grow
D	keeps your body healthy
E	keeps your bones and teeth strong

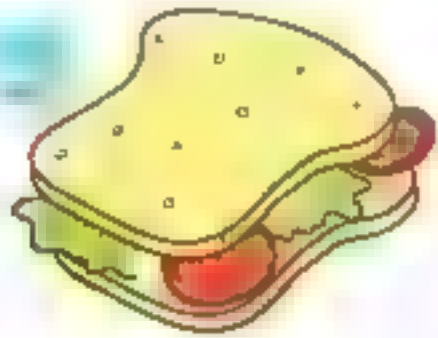


Here is a healthy meal. Explain why it is healthy

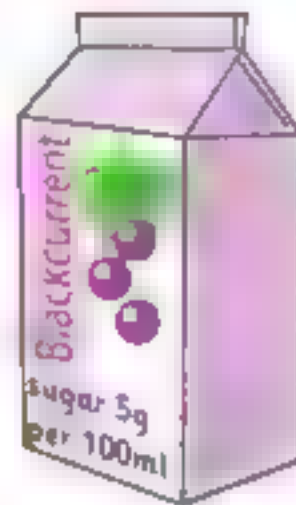




Which sandwich is more healthy? Why?



These drinks have different amounts of sugar per 100ml



Draw a table like this to show how much sugar is in each drink

Drink	Sugar per 100ml in g

Draw a bar chart to present your results

Living things

Words to learn

breathe

young

grow

excrete

life processes

sort



The plant pot is alive because it has a plant in it

The bee is alive because it's flying

The plant is alive because it's green



The bee and plant are alive because they both need air

Do you agree with what the learners say?

Which things are alive?

Which things in these pictures are alive?



Things that are alive:

- need air to **breathe**
- need water and food
- can move
- have senses
- can produce young
- **grow**
- produce waste products (**excrete**).

These are the seven **life processes**

Activity 3

Living or not living?

With a partner, **sort** pictures of things into two groups:

- living things
- non-living things.

Use the seven life processes to help you decide where to put each picture.

Were there any that you found difficult to place? If so, explain why.

Questions

- 1 List the **seven** life processes
- 2 A horse can run, eat, drink and see
Is it alive?
- 3 A toy kite moves and flies in the air
Is it alive?

You will need:

a large sheet of paper pens
a selection of pictures of things that are living and non-living

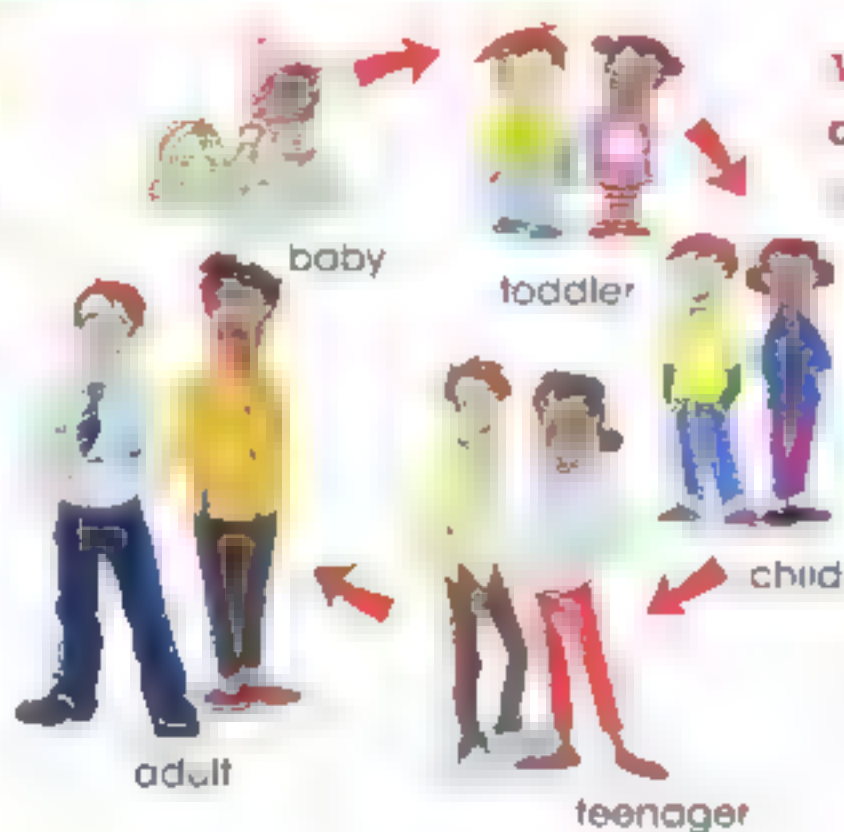
Talk about it!

How do you know if something is living?

What you have learnt

- All living things need air to breathe, need water and food, can move, have senses, can produce young, grow and produce waste products

Look at these pictures
Where are you
now in
the cycle?



Words to learn

adult

feed



All living things have
young. The young
grow. An **adult** is
fully grown.

Name the young for each of these animals

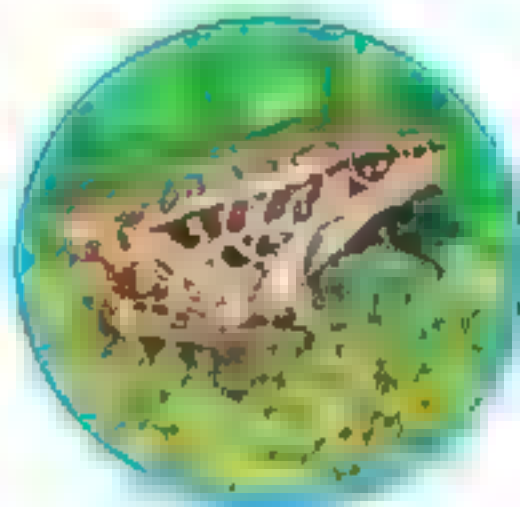
bear



cat



frog



Plants grow in stages

A seed



The seed begins
to grow.



A young plant
develops.



The young plant
becomes a
fully grown
flowering plant



Animal food comes from plants and other animals
Some animals feed their young

Plants make their own food. Plants use the light from the Sun and carbon dioxide from the air to make sugars. They make sugar in the green parts of the plant and release oxygen as a waste product.



Activity 3.2

Make a bird feeder

You will need:

a plastic container string a hole punch fat bird seed

Punch two holes near the top of the plastic container.
Melt the fat (get an adult to help you).
When the fat has cooled a little, stir bird seed into it.
Carefully pour the mixture into the plastic container (do not fill it to the top).



When the mixture is cold, thread the string through the holes and hang your bird feeder somewhere outside.

Questions

- 1 What are the stages of growth for a human being?
- 2 How do plants make their food?
- 3 Where does human food come from?

What you have learnt

- Animals and plants grow.
- Plants make food by using sunlight to make sugars.
- Animals' food comes from plants and other animals.

Talk about it!

What food is eaten by animals that you know?



All animals and plants move

Words to learn

reproduce offspring



Plants move slightly towards the light.

They can also spread across areas as their roots systems grow.

Their seeds can also move

Activity 3.3

Make a model of the moving parts of your body

Cut out the parts of the body from the template

Use split pins to join the parts together

You will need:

a template of parts of the body split pins



Living things **reproduce** so that new animals and plants can **grow** to become adults
Plants make seeds Animals and birds lay eggs or have babies

When animals reproduce they often make a special home for the young or the eggs
Some animals carry their young.

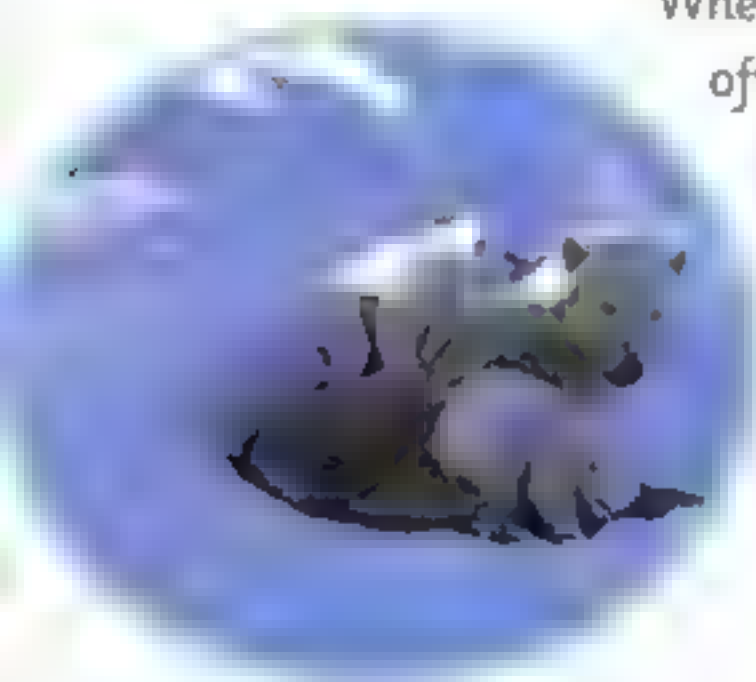
Some animals do not prepare a home
The **offspring** have to look after themselves

Fish swim off into the sea without parents

Caterpillars are left to look after themselves



A bird brings material to make a nest



Two polar bear cubs with their mother at their den



A baby kangaroo in its mother's pouch

Questions

- 1 Name an animal and the shelter it makes for its eggs or young
- 2 Why are young caterpillars left to look after themselves?

What you have learnt

- 1 All animals and plants move and all living things reproduce

Talk about it!

Why do some parents make a safe place for their eggs or young?

3.4 Sorting humans

Look at other people. They are all similar to you but also different. Our eyes are different colours.

Words to learn

similar	different
fingerprint	identify
data	tally



These children all have similar bodies but there are differences. What two things are similar? What two things are different?



loop



arch



whorl

People have different shapes on their **fingerprint**.

Look at your fingers. Use a magnifying glass if possible. **Identify** which type of fingerprint you have.

Activity 3.4

Collecting data

You will need:

paper clipboard pencil




Collect **data** about your classmates.

Make a chart like this to help you.

Name	Hair colour	Eye colour	Height in m
Sunita	black	brown	1.2

Collect the names of your classmates and data about their hair, eyes and height.

Then **tally** the data on a tally chart like this one

Hair colour	Brown	Black	Blonde
tally			
total	7	2	3

Questions

- 1 What are the common eye colours in human beings?
- 2 In what ways are we the same as other people?
- 3 How are we different from one another?

What you have learnt

- People are similar in some ways but different in others
- Fingerprints are all different.
- People have different hair colour, eye colour and heights

Talk about it!

What differences are we born with?

Scientists who study living things need to be able to **group** them

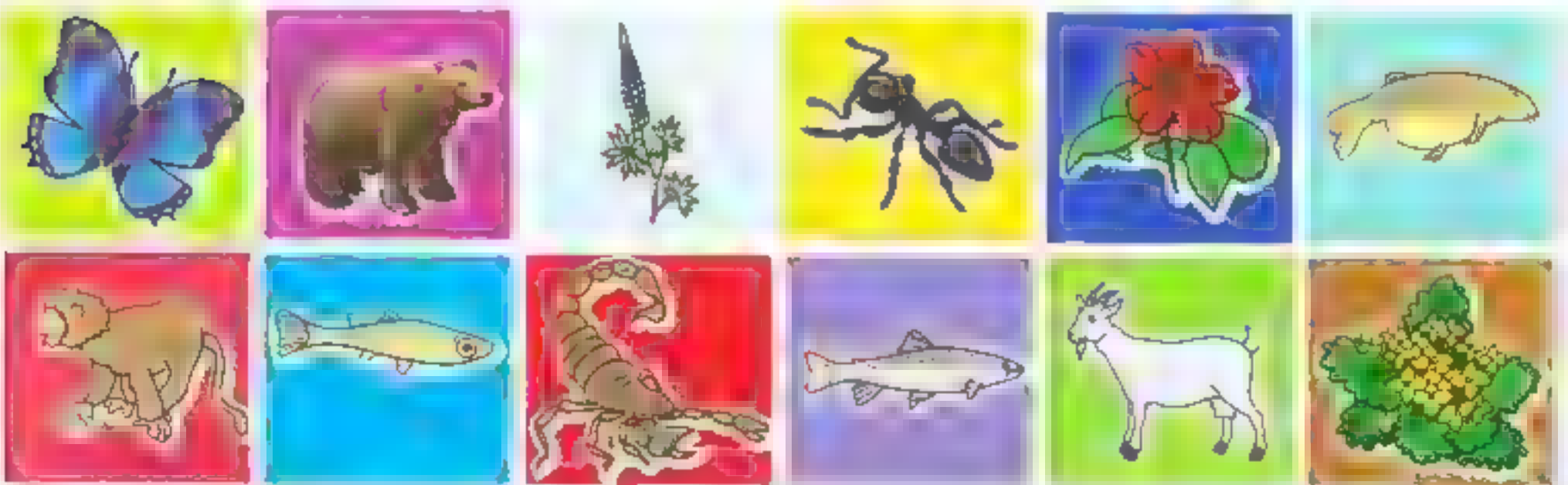
Words to learn
group question



Help the zookeeper sort the animals into the correct group

Look at these pictures.

Talk to a friend about how you could sort these living things



Describe the things that are similar about the things in your groups

Juma has collected these small animals. Suggest groups he can put them in.

Suggest a **question** that he could use to sort the animals.



Activity 3.5

Sorting leaves

Sort your leaves into groups.

Put each group into a hoop.

Label each group.

Could you have sorted the leaves in a different way?

You will need:

a selection of different leaves hoops
labels for groups

Questions

- 1 How many groups of animals and plants do you know? What are they?
- 2 Why do scientists need to group animals?
- 3 Why might you group a lion and a wolf together?

What you have learnt

- Living things can be put into groups.
- The groups have something in common.

Talk about it!

What groups do animals and plants around your home belong to?



Magda's book contains pictures of these things. Help her to say which are alive and which are not alive.



Here are some life stages of living things.

a	_____	→	tadpole	→	frog
b	egg	→	_____	→	hen
c	_____	→	child	→	adult
d	seed	→	seedling	→	_____
e	baby	→	foal	→	_____

Copy and complete each line. Use these words to help you.

horse frog spawn chick plant baby



Why do you think the snail is moving?

I think the snail is moving towards the light.



I think the snail is looking for a friend.

The snail looks hungry.



Salif has found this table about the number of young produced by some animals

Animal	Number of young produced
rabbit	8
birds	6
human	1 or 2
fish	1000s of eggs
spiders	100s of eggs

- a Which animals can have the most young?
- b Why do some animals have many young?

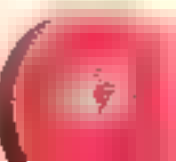


Here is a plant



For this plant which questions are 'true' and which questions are 'false'?

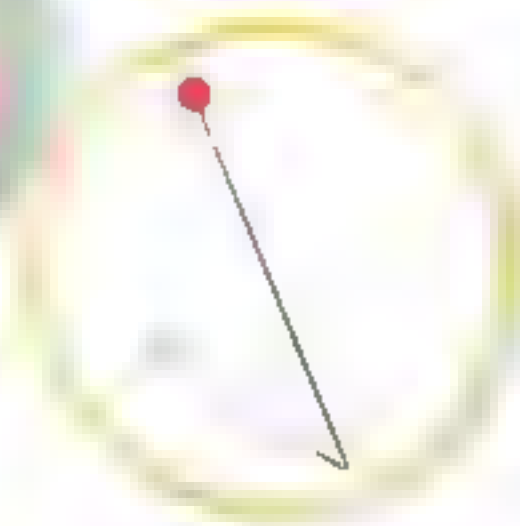
- a Does the plant have green leaves?
- b Does the plant have a flower?
- c Is the plant a tree?
- d Does it have berries?



A sense is a way of finding out about the world around you
The senses are touch, sight, hearing, smell and taste

Your ears are hearing all the time

Which of these makes the
loudest sound? Which is the quietest?



Activity 4.1a

Pointing at sounds

Blindfold a friend

Make a sound

Ask your friend to point to the source of
the sound

What can you conclude from their action?

You will need:

- material to act as a blindfold
- something to make a sound (small bell or two spoons)



We have all hurt ourselves
All of your skin can feel things
touching it: hot and cold, rough and
smooth, dry and wet.

Activity 4.1b

Touch test

Blindfold a partner.

Give your partner each item in turn
(the order does not matter)

Ask them to touch each item and
describe how it feels.

Can they tell you what it is?

You will need:

wet and dry tissues · ice cubes · sandpaper
wood · plastic · metal · a blindfold



It's rough, it's very
rough, it's sandpaper

Questions

- 1 How many senses do you have?
- 2 a Give an example of a very quiet sound
b Give an example of a very loud sound
- 3 Where on your body is your
sense of touch?

What you have learnt

- Humans have five senses: hearing, touch, taste, smell and sight.
- The senses work together to help humans find out about the world around them.
- You use your ears to hear and your skin to touch.

Talk about it!

If you were blind, how
important would your
other senses be?

Taste and smell

A tongue has taste buds which sense tastes like salt and sweet, bitter and sour.

Taste works with smell to stop us from eating food that would make us ill.

If something smells bad it generally tastes bad too.

If your nose is blocked you cannot taste very well.

Some animals have small noses.
Others have big noses.

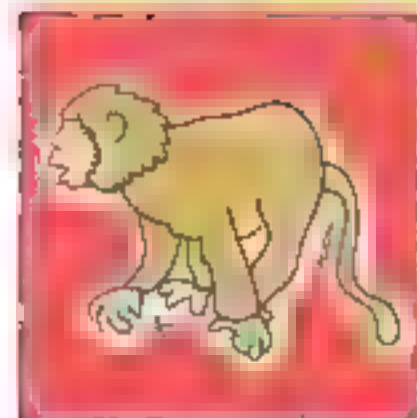
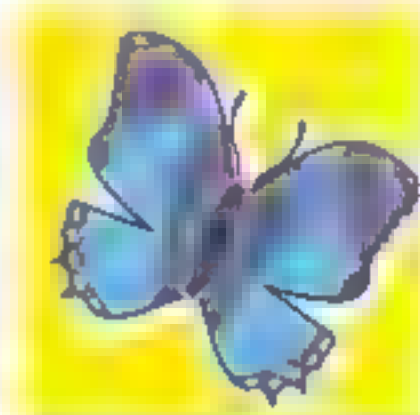
Words to learn

tongue sweet

bitter sour



Which of these animals do you think can smell things the best?





Bears have a very good sense of smell. Bears can smell food far away.

Snakes smell with their tongues.



Animals which find their food on the ground have a good sense of smell.

Activity 4.2

Do you like or dislike the following?

Blindfold a friend.

Ask them to taste each sample of food and say whether they like it or not.

Repeat the test but, this time, ask your friend to hold their nose so that they cannot smell the food. Does this affect how they taste the food?

You will need:

clean food samples on separate plates
clean spoons plates blindfold



Questions

- 1 What part of our body do we use to taste things?
- 2 What part of our body do we use to smell things?
- 3 Why do we need to smell and taste foods?

What you have learnt

- The senses of taste and smell often work together.

Talk about it!

Why do some animals have a very good sense of smell?



What colour eyes do you
and your friends have?



Your eyes are fantastic
They can see things close to
you and much further away

Word to learn
eyesight



Some animals have very good **eyesight** and some animals do not



These animals
use their very good
eyesight for hunting prey



This mole does not
have very good
eyesight. Instead,
the mole uses his
nose to find his way
around



Centaurus A, a galaxy
that can be seen with
naked eyes. It is around
12 million light years
from Earth

With our eyes we can see what is
happening in the world. You can
test your eyes



Activity

Make a chart like the one below.

Choose a set of letters or numbers
Print these in different sizes on your
piece of paper.

Fix the paper 2 or 3 metres away

Cover one eye while you read the letters or numbers out to
check that you can see them clearly.

Now check your other eye

Try your test with other people.

How far down the chart could you read
the letters?

Was the result the same for both eyes?
Did other people have the same result?

You will need:

a large piece of paper a metre ruler
something to cover one eye



Questions

- 1 Why do some animals have good eyesight?
- 2 Give an example of where a human needs to
see things.
 - a close up
 - b at some distance away.

What you have learnt

- Some animals have very good eyesight
- Human eyes are a variety of colours.
- The human eye can see things that are very
close and things that are some distance away

Talk about it!

How do animals who do
not have good eyesight
find out about
their world?



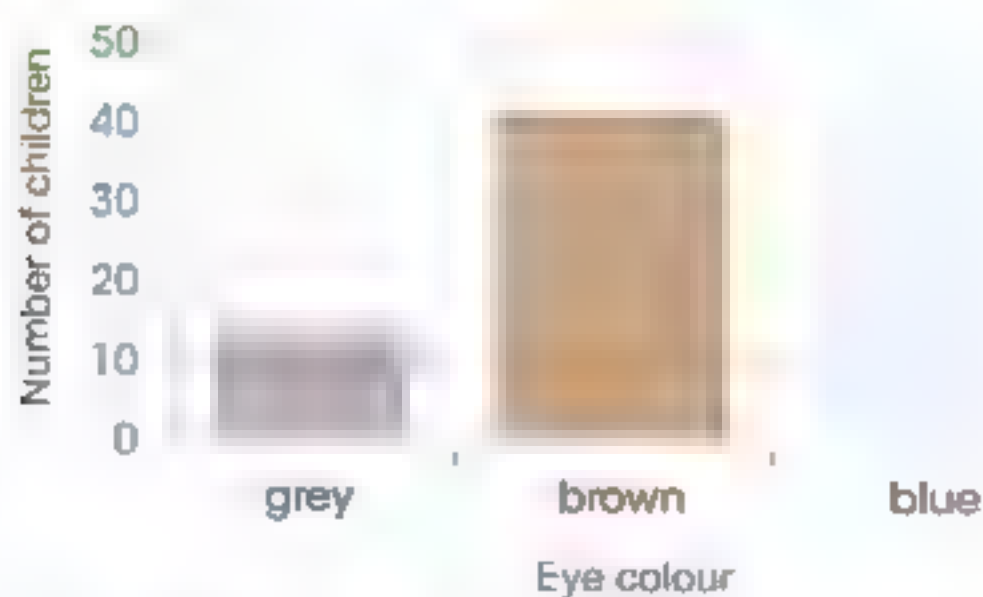
These animals have a good sense of smell



Give two reasons why they need a good sense of smell



Alex has recorded the eye colour of the children in his school on this graph.



- a Which is the most common eye colour?
- b Which is the least common eye colour?



Amal tested his friends to see which things they like and dislike

Name	Food	Like	Dislike
Bill	apple	✓	
	biscuit	✓	
Jaffa	apple	✓	
	biscuit	✓	
Pat	apple		✓
	biscuit	✓	
Rava	apple	✓	
	biscuit	✓	

- a Which food is most popular?
- b Why do children like apples and biscuits?



- a Describe how to carry out a taste test. Include details of the equipment you would use.
- b How could you investigate whether the sense of taste and the sense of smell are linked?





A **property** describes what a material is like

Words to learn

property **flexible**
rigid **waterproof**
absorbent



Metal is strong but paper is weak



Rubber is **flexible** (it can be bent) but stone is **rigid** (it keeps its shape)



Plastic is **waterproof** (water cannot get through it)
but cotton is **absorbent** (it soaks up liquid)

Activity 5.1

A materials hunt

Find some materials

Look carefully and feel the materials

What properties do they have?

Draw a table like this and write down the properties of the materials

Material	Properties
paper	weak, flexible, smooth, absorbent

Describe the properties of a material to a partner

Can they guess which material it is?

Questions

- 1 List as many different materials as you can
- 2 Which material is
 - a silver, shiny and strong
 - b transparent, smooth, rigid and weak?



Yuri Gagarin wore the first space suit in space in 1961

What you have learnt

- There are many different materials.
- Materials have many different properties

Talk about it!

Which materials would you use to make a space suit?

5.2 Sorting

A material can be put in a group
These materials are sorted into **hard**
and **soft** groups

Words to learn

hard

soft

dull

shiny



The same objects can also be sorted into **dull** and **shiny** groups



Activity 5.2

Sorting materials

Look at the picture to see **what** to do.

You will need:

some objects each made from a single material

Let's separate
the materials as
hard or soft

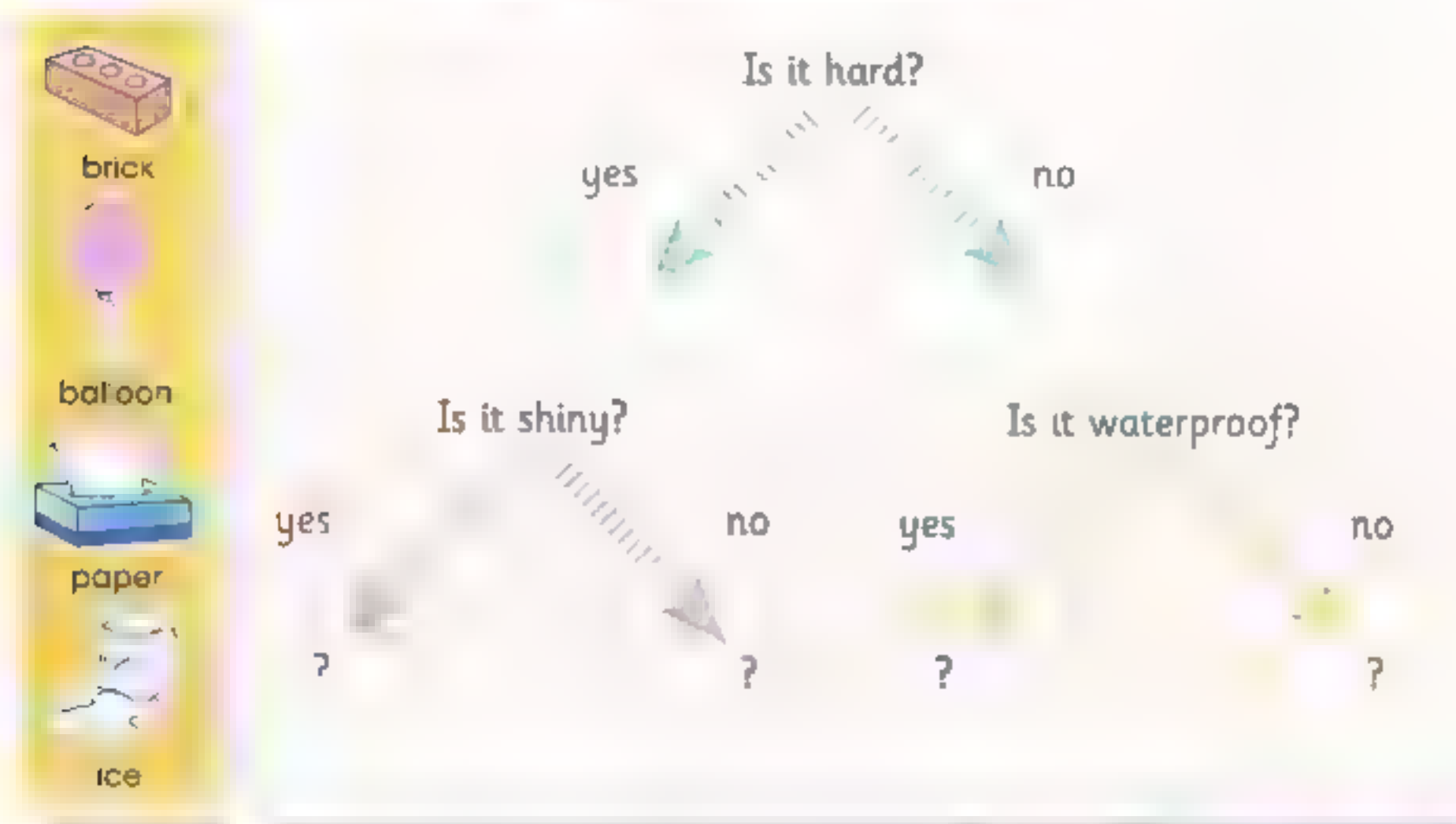
Hmm is the ball of
wool hard or soft?

It's soft, so
let's put it in
that group



Now choose another
property and sort
the objects into two
different groups.

There are different ways of sorting. A branching tree database can be used to identify these four objects.
Choose one of the four objects and answer the questions.



Questions

- 1 Write **three** different materials that are waterproof.
- 2 Write all the properties you can think of for plastic.

Graphene is a new material that is very strong and very light.

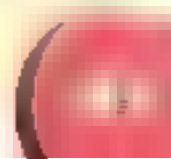


Talk about it!

What could graphene be used for?

What you have learnt

- Materials can be sorted in different ways.
- A branching tree database can be used to identify objects.





Every material has properties. The properties make a material good for making some objects but not for others.

Here are some common materials, what they are used for and the properties they have.

Word to learn
observation



Wood is hard, strong and easy to make into objects such as chairs or bookcases.



Plastic is strong, waterproof and easy to shape into objects such as bottles and bins.



Metal is strong, does not burn and can be sharp. Scissors, pans, knives, forks and spoons are all made from metal.

Metal is a sensible material for a pan because of its properties. What would happen if the pan was made of wood?

Here are some other objects made from silly materials.



Activity 5.3

Why is that material useful?

Find objects in the classroom that are made of only one material.

Talk about why each object is made of that material.

On a large sheet of paper, draw a table like this. Write each **observation** you make in the table.

Object

Material

Useful properties of that material

chair



plastic

Strong so it does not break.

Flexible to make it curvy.

Light so it is easy to move.

Questions

- 1 Which material would be good for making sunglasses? Why?
- 2 A long time ago, knights used to wear metal armour. Why is metal not used for clothes?



A car made from ice!

What you have learnt

- 1 How material is used depends on its properties

Talk about it!

Why is a car made of ice a silly idea?

You will need:

some fabrics paper metal foil a small funnel
measuring cylinder a timer

Which material is best for an umbrella?

An umbrella needs to be waterproof

Predict which material will be the most waterproof. The waterproof materials will not let the water through.

Look at the pictures to see what to do

Write your results in a table

What will you keep the same to make this test fair?

Look closely at the materials that are not waterproof. Can you see why they are not waterproof?



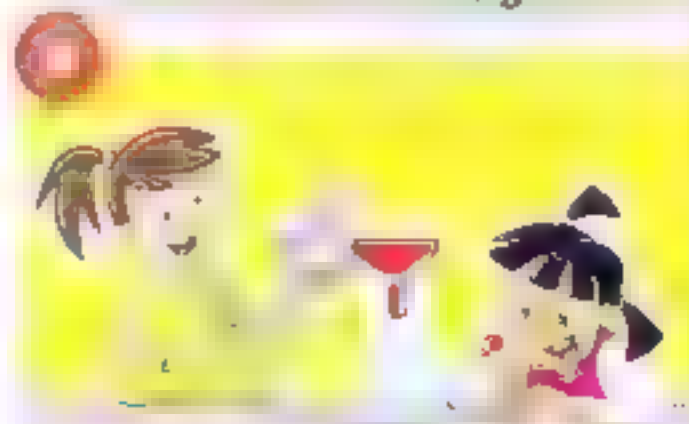
Set up your equipment as shown



Place your material in the funnel



Pour water into the material and start timing



Is there any water going into the measuring cylinder?

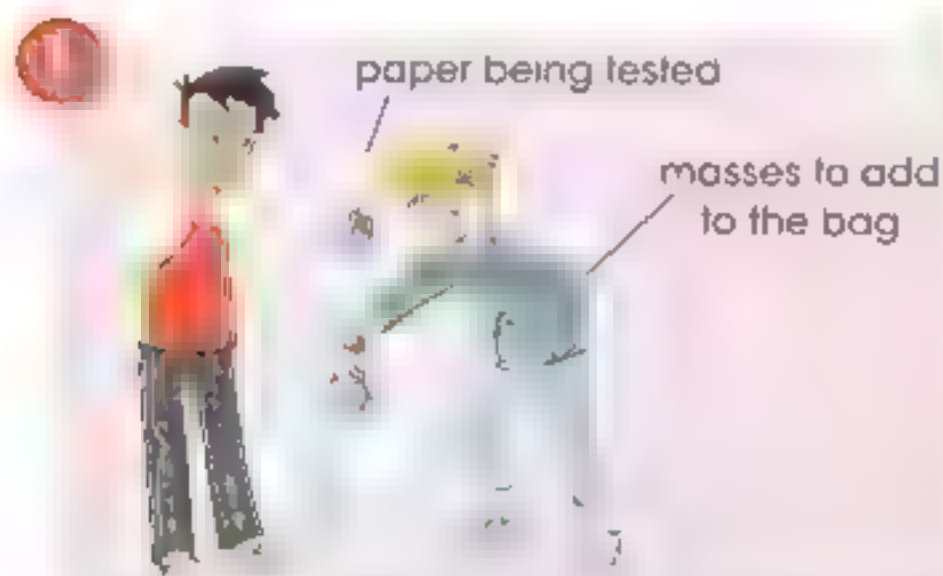
Activity 5.4b

Which is the **strongest paper bag**?

Look at the pictures to see what to do.
Predict which paper will be strongest.
How will you make this a fair test?

You will need:

thin pieces of different types of paper
some masses a strong plastic bag



Write your results in a table.

Look closely at the strongest paper. Can you see why it is strong?

Questions

- 1 Why do the pieces of paper have to be the same size?
- 2 Is paper a good material for a bag? Why?

What you have learnt

- Objects that need to be waterproof have to be made from waterproof materials.
- Objects that need to be strong have to be made of strong materials.

Talk about it!

How could you investigate which paper towel is the most absorbent?



Anita has a magnet!
There are lots of
different types
of magnets

Words to learn

magnet	attracted
magnetic	non-magnetic
pattern	



Magnets are **attracted**
to some materials
We say these materials
are **magnetic**
Materials that are not
attracted to magnets
are **non-magnetic**

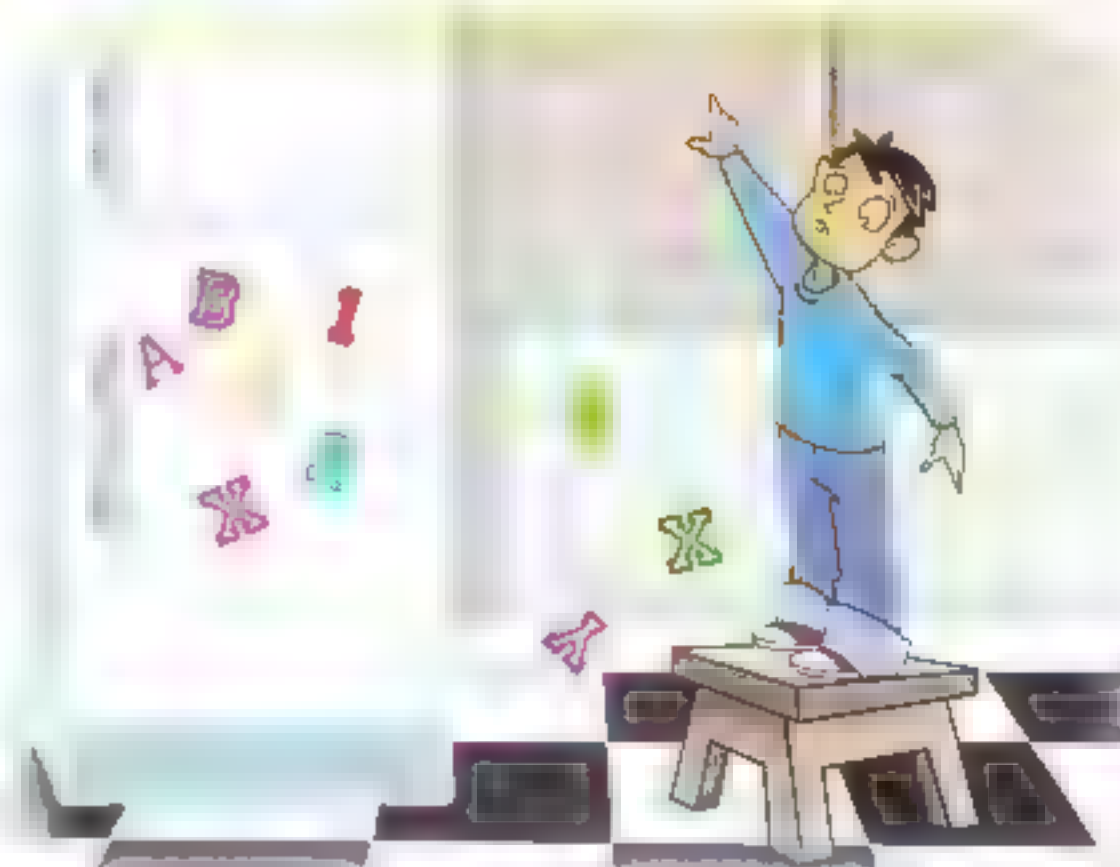


Magnets can be used
to separate magnetic
materials from non-
magnetic materials.
This magnet is
separating magnetic
metal from other
rubbish for recycling

Sunil is trying to put a fridge
magnet on the cupboard door
but it keeps falling off. Why?

Questions

- 1 Name a magnetic material.
- 2 List three materials that are not magnetic.
- 2 Why did Sunil's magnet not stay on the door?



Activity 5.5

Which materials are magnetic?

You will need:

a magnet some materials to test

Help Sunil by testing some materials.
Look at the pictures to see what to do



Predict which materials will be magnetic and then investigate
Draw a table like this one for your results

Object	Material	Magnetic	Non-magnetic
chair	plastic		✓

Look at your results. Can you see a pattern?
Are some materials always non-magnetic?
Which materials are magnetic?

What you have learnt

- Some materials are magnetic.
- Many materials are non-magnetic.

Talk about it!
What else could we
use magnets for?



Write three properties for each of these materials

The first one has been done for you.

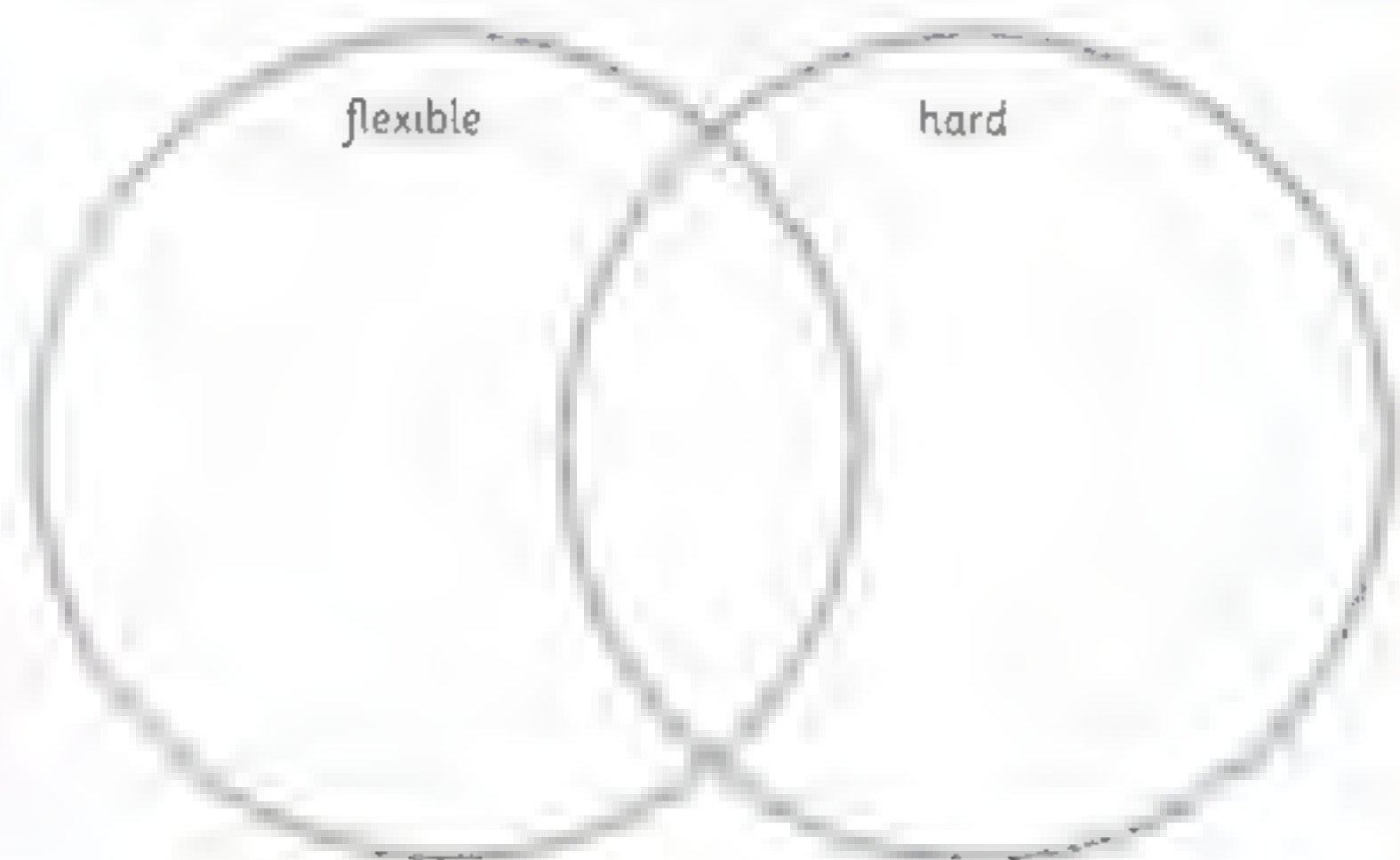
plastic metal glass paper stone

Plastic is smooth, flexible and light.



Copy this Venn diagram and write the following objects in the right places.

cotton T shirt wooden pencil stone metal paperclip plastic ruler


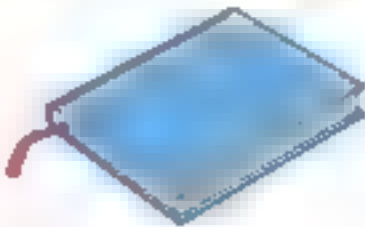






Draw a picture to show what will happen to the metal toy car



Copy and complete this table

Object	Magnetic	Non-magnetic
a metal can 		
a book 		
a football 		
metal scissors 		



Every day you **push** and **pull** many things
Push and pull are examples of a **force**

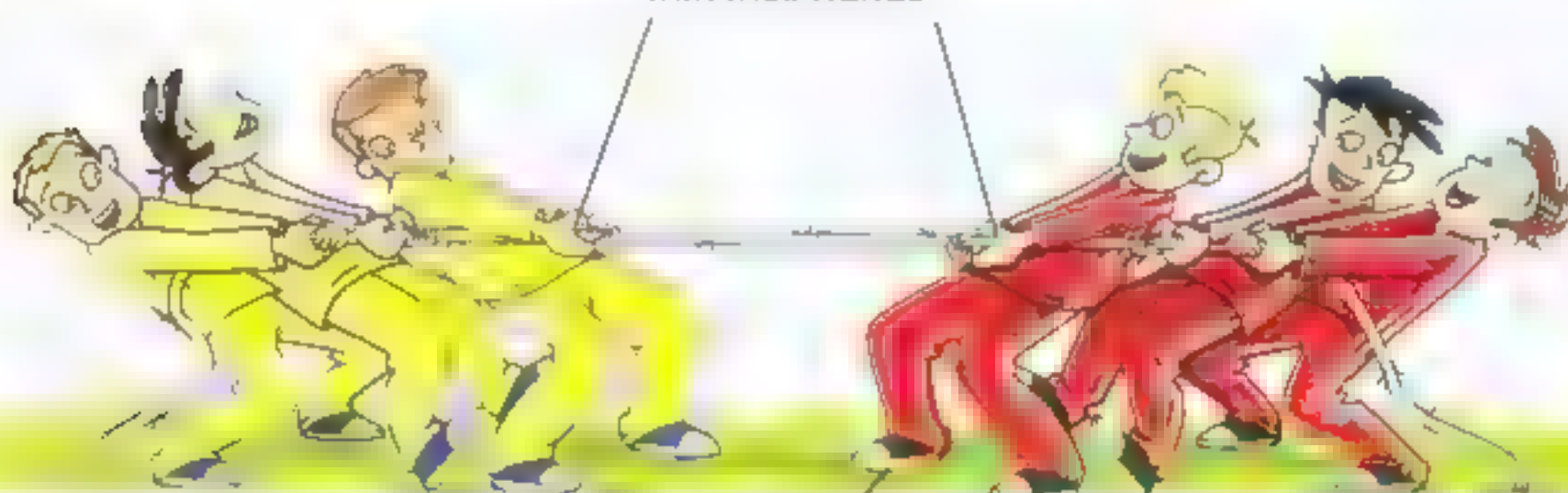
Words to learn

push	pull
force	start
get faster	slow down
direction	



Six children divide into two teams to have a tug of war
How are the children using pushing forces and pulling
forces? What could they do so that they don't get hurt?

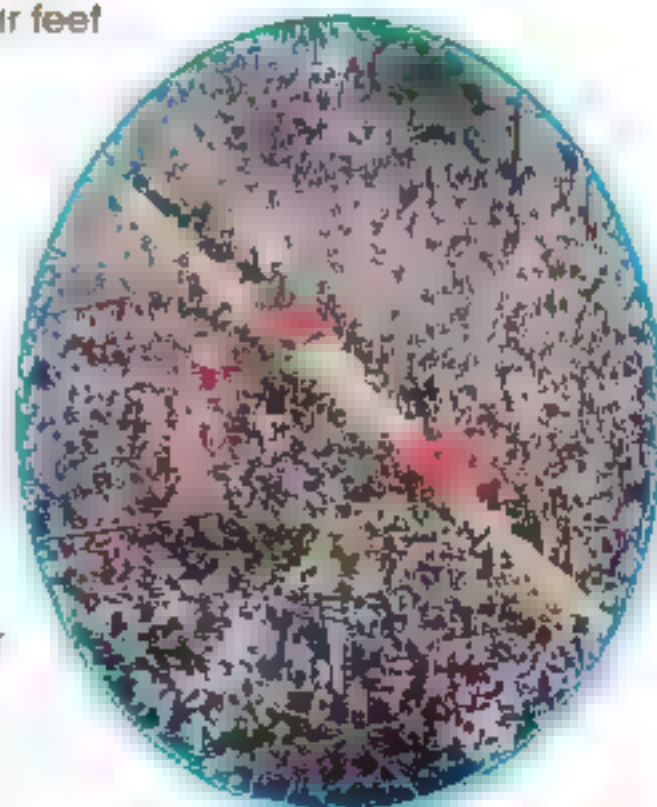
Each team pulls hard They pull
with their hands



Each team pushes with their feet

Forces can **start** and stop things moving
They can also make things **get faster**,
slow down or change **direction**.

A 'great tug of war' that
involves thousands of
people is held in Naha,
Okinawa, Japan. It uses two
ropes made of rice straw.
Each rope is 2m in diameter
and over 300m long



Activity 6.1

Forces start and stop things moving

Work with a partner and find ways to start each of your objects moving

See if you can feel the push or pull you are using

Now find ways to stop each of the objects from moving.

See if you can feel the force you are using this time

Finally, find ways to change the direction in which each object moves.

You will need:

a ball some water in a bowl

a balloon a chair a pencil

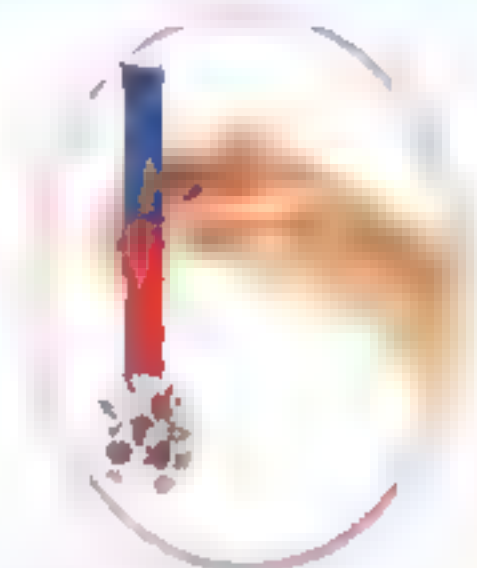


Challenge

How could you investigate how the size of the push or pull you give to a ball affects how far it moves?

Questions

- 1 Make a list of forces you have used so far today
- 2 List **five** things you move with a pulling force
- 3 Name a game in which you change the direction of a ball.



Magnets can be used to pick up magnetic objects.

What you have learnt

- Push and pull are examples of a force
- We can use forces to start things moving, stop things moving and change their direction

Talk about it!

What have magnets got to do with forces?



Forces can change the shape of things

Words to learn

observe effect



A baker uses a force when making bread.

This potter is using a force to create a clay pot



This carpenter is using a force to carve the wood

Activity 6.2a

Investigating forces

Drop a ball of clay from a height of 5cm

Observe what happens to the ball of clay

Write down your observations or draw what the clay looks like.

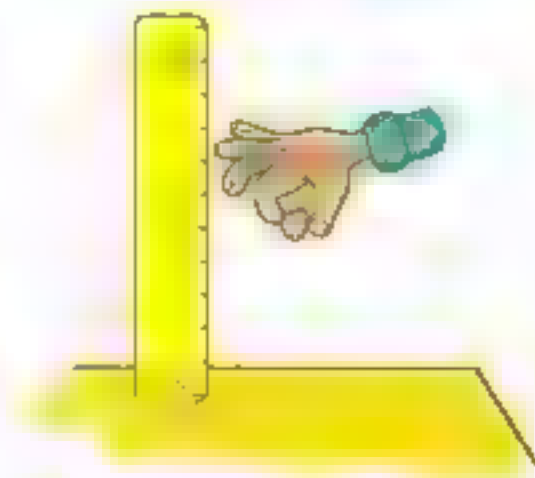
Shape the clay into a ball again. Drop the ball from a height of 10cm. What is the **effect** on the ball of clay?

Drop the ball of clay from three more different heights

Use ideas about forces to explain the pattern

You will need:

a ball of clay ruler



Activity 6.2b

Dropping a ball onto objects

Try using your hands to change the shape of the objects in front of you. Which were easy to change? Use a wide, tall paper tube to drop a heavy ball onto the objects.

First, predict what will happen to each material. Use a table like this.

Object	Prediction	Result
biscuit	break	broke into 5 pieces
clay		
raw vegetable		
cooked vegetable		
stone		



Plan and carry out this test. How will you make it a fair test? Record the results.

Questions

- 1 Do all materials change shape when they are pulled or pushed by hand?
- 2 List some workers who have to change the shape of materials.

What you have learnt

- Forces can change the shape of things

Talk about it!

How do forces in nature change the shape of the land?

There are small forces and big forces



Omar pulls his toys with elastic. He is pulling with more force on some toys. How can you tell that this is the case? What toy do you think needs the biggest force?



This girl is using a small force to pull on the empty sledge.

It takes a bigger force to pull this vehicle.



A volcano has so much force it can blast large rocks high in the air.



Activity 6.3

Investigating how much force

Push against different objects with a balloon until they move. The bigger the force you need to move the object, the more squashed the balloon will be

Choose **five** objects to push against

Record your results. Say whether you used a very small force, a medium force or a large force

You will need:

a balloon • objects to push against



Questions

- 1 Put these in order from the biggest force to the smallest force
 - a horse pulling a cart
 - a girl lifting a book
 - a train pulling wagons
 - a bird picking up a leaf
- 2 Saida stretches an elastic band. Is this a pulling force or a pushing force?



All sorts of large things can be moved with a large force

What you have learnt

- ☞ There are different sizes of force.

Talk about it!

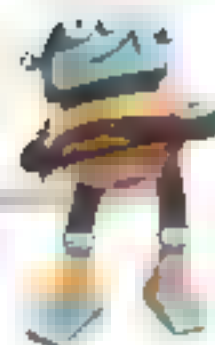
How could you measure the size of a force?

6.4 Forcemeters



If you push on a door with foam you can see the size of the push

Words to learn
forcemeter newton



Aleksy and Peng both push on a piece of foam
We can see how hard they push



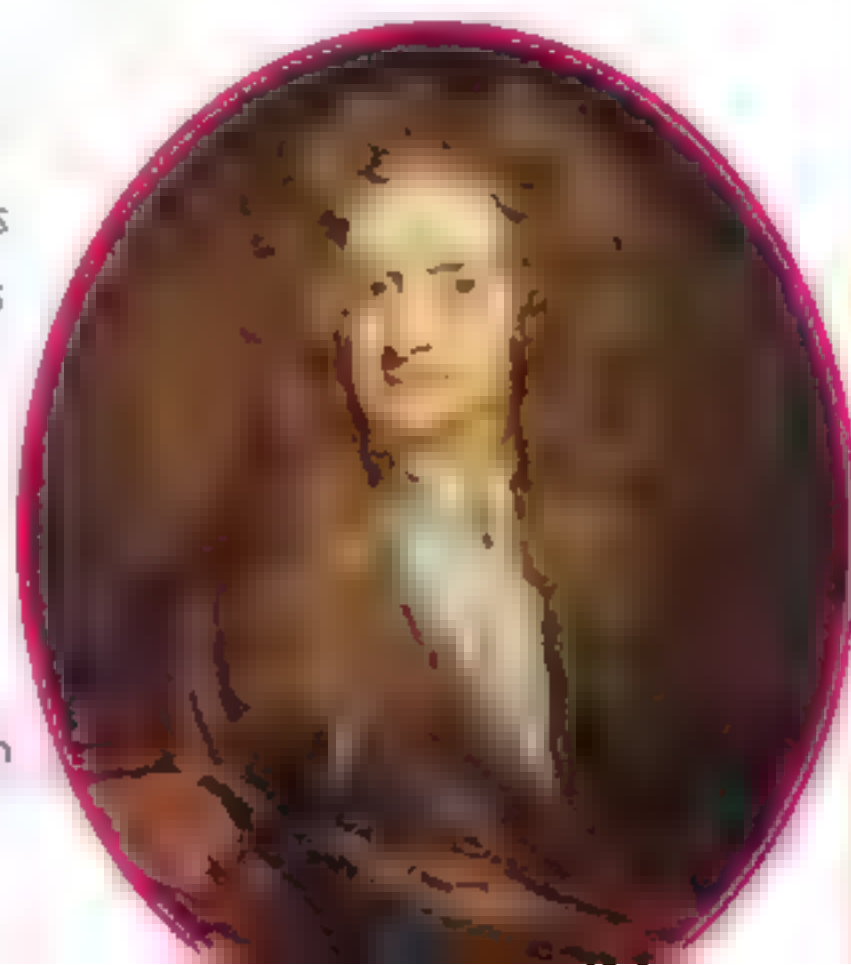
A **forcemeter** is a piece of equipment that measures the size of a force. Forcemeters measure the size of pulls

The unit of force is the **newton** (N). The unit is named after the famous scientist Isaac Newton, who did a lot of work on forces



Forcemeters measure the size of pulls.

Sir Isaac Newton



Activity 6.4

You will need:
a forcemeter

Measuring forces

Use a forcemeter to measure different pulling forces around your school. Before you measure, predict which object will need the biggest force to pull it. Record the sizes of the forces in a table. Draw a bar chart to show the results. Compare your predictions with what you found out.



Tennis players use forces of different sizes to control the ball.



The forces in the ropes will be different for different climbers.



A cycle helmet must be strong enough to protect the cyclist if their head gets hurt by a force.



The wind creates a force on the sail which moves the boat through the water.

Questions

- 1 What is the unit of measurement of force?
a a newton **b** a forcemeter **c** a pull?
- 2 Why is it important for equipment for sport to be strong?

What you have learnt

- There is simple equipment which we can use to measure forces.
- The unit of measurement of force is the newton.

Talk about it!

What could you use to measure pushing forces?

Friction is a force that acts when two surfaces rub together. Some materials cause more friction than others

Words to learn

friction

grip

smooth

rough



Rub your hands together
Feel them rubbing and
getting warm



You can go very
fast down a slide
There will be
friction between
your clothes and
the surface of
the slide



When hands are
rubbed together
friction acts
between them

Friction can start and stop things moving
You need the friction between the floor and
your shoes to help you start walking



There is friction between the bottom of your shoes and
the floor which helps your shoes to **grip** the floor surface
This stops you from sliding

Ice is slippery. There is little
friction between the puck
and the ice and so the puck
slides easily when it is hit by
the player's stick



If you roll something across a surface,
friction will cause it to slow down. It will
stop at some point. Friction also helps
things to change direction

The friction between the ball
and the bat helps the ball to
change direction

Activity 6.5

Forces and friction

You can use a forcemeter to find out about friction. If there is more friction, you will need a bigger force to make something move.

Plan an investigation.

You will pull a trolley across different surfaces with a forcemeter.

Predict which surface will produce the most friction. Try using a very **smooth** surface and a **rough** surface.

How will you measure this? How will you record your results?

When you have done the test, decide what your conclusion is.

If you have time, test other surfaces.



You will need:

a small trolley, a forcemeter, different types of surface

Questions

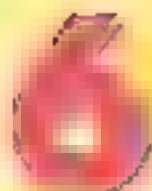
- 1 When does friction act?
- 2 Faye loves her garden slide. She finds that when she wears cotton clothes she goes faster than when she wears woollen clothes. Explain why.

What you have learnt

- Friction acts when two surfaces rub together.
- The size of the friction force depends on the two surfaces which are rubbing together.

Talk about it!

Why are some shoes safer to wear on ice than others?



Chapter 6 Forces and movement

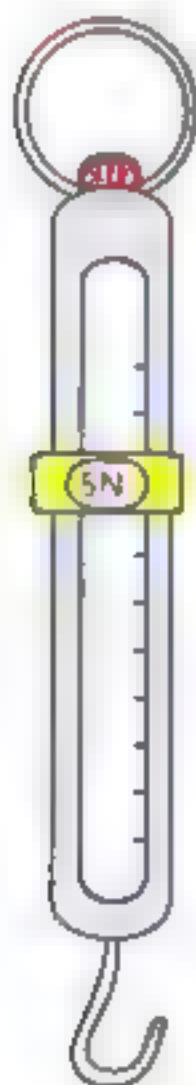


Here is a ball bouncing toward Kamuli.

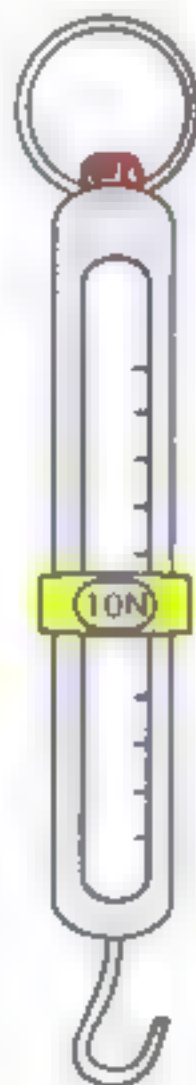
- a How can she stop it?
- b How can she change the ball's direction?



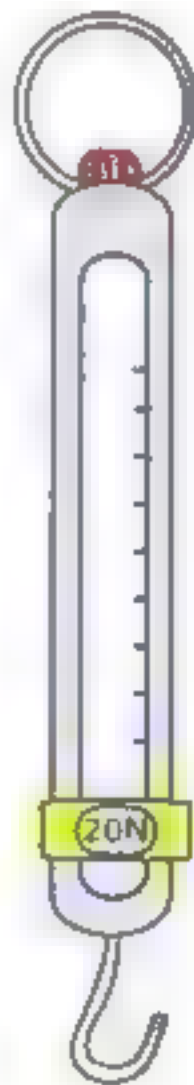
Which forcemeter is measuring the greatest force?



A



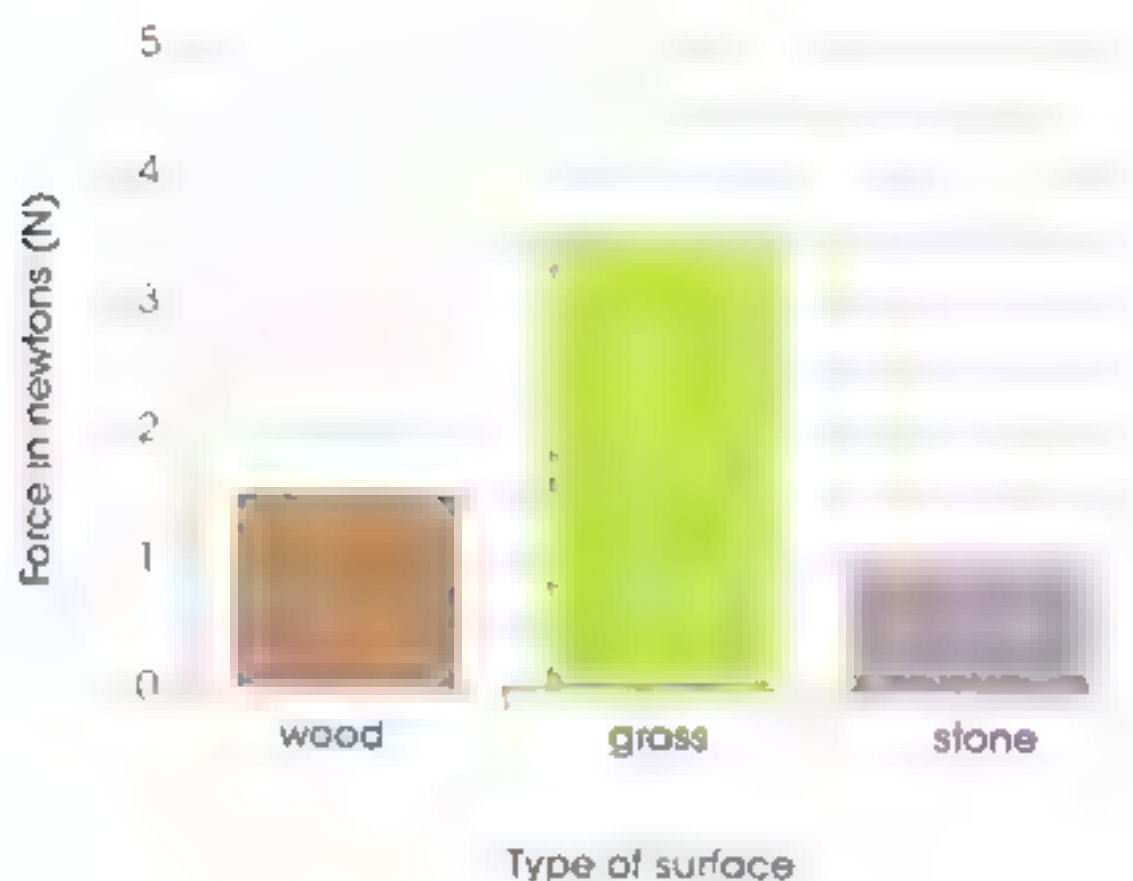
B



C



Alex tested the force needed to pull his skateboard over different surfaces. Here are the results



- a Which surface was the hardest to pull the skateboard on?
- b Which surface was the easiest to pull the skateboard on?



Which surface creates the most friction with a skateboard

- wood
- grass
- stone?

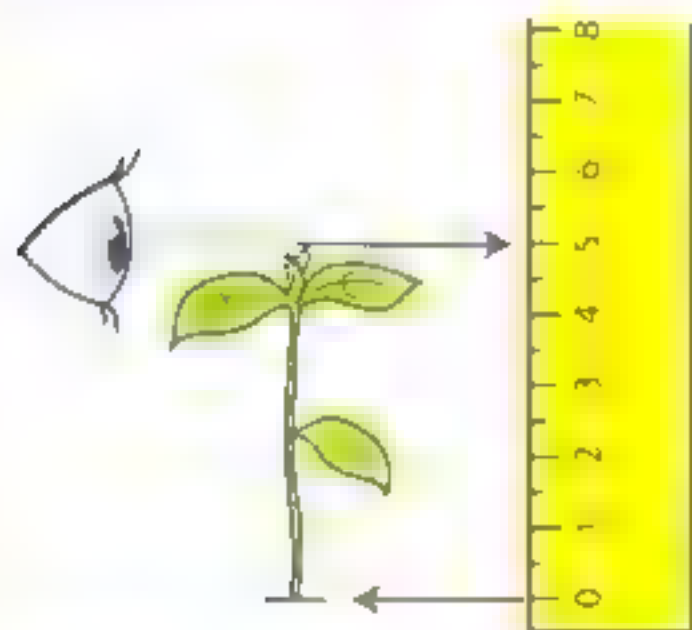
Explain your answer.



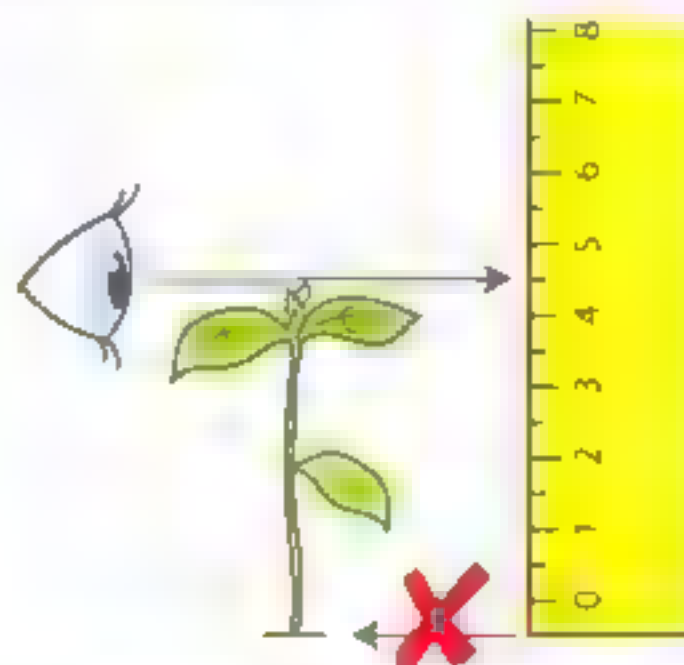


This section of the Learner's Book covers some of the new scientific enquiry skills for this stage. They build on the skills already gained from previous stages. You should refer to these skills whenever you need them.

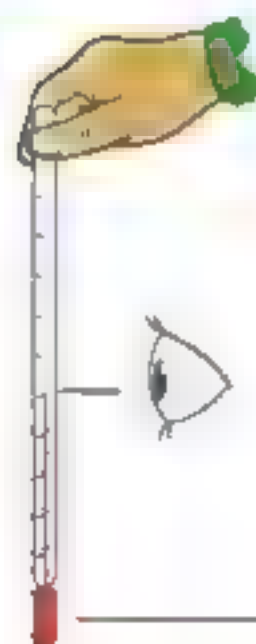
Put the zero on the ruler next to the end of the object



Put your eye level with the top of the object to read the scale



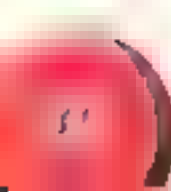
Be careful. Often the zero is not at the end of the ruler

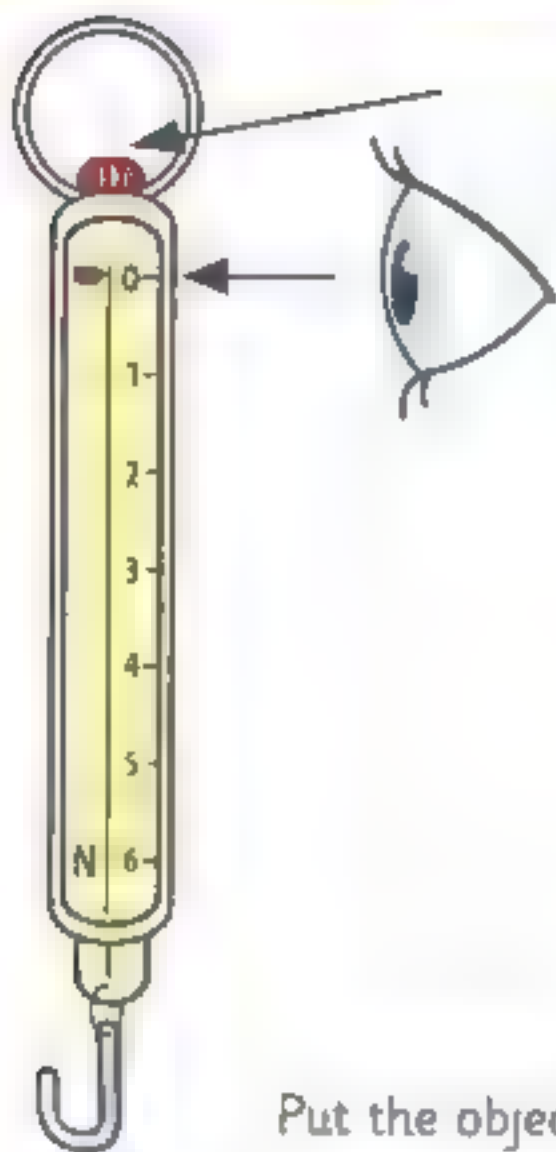


Hold the thermometer at the top.

Put your eye level with the top of the liquid to read the scale

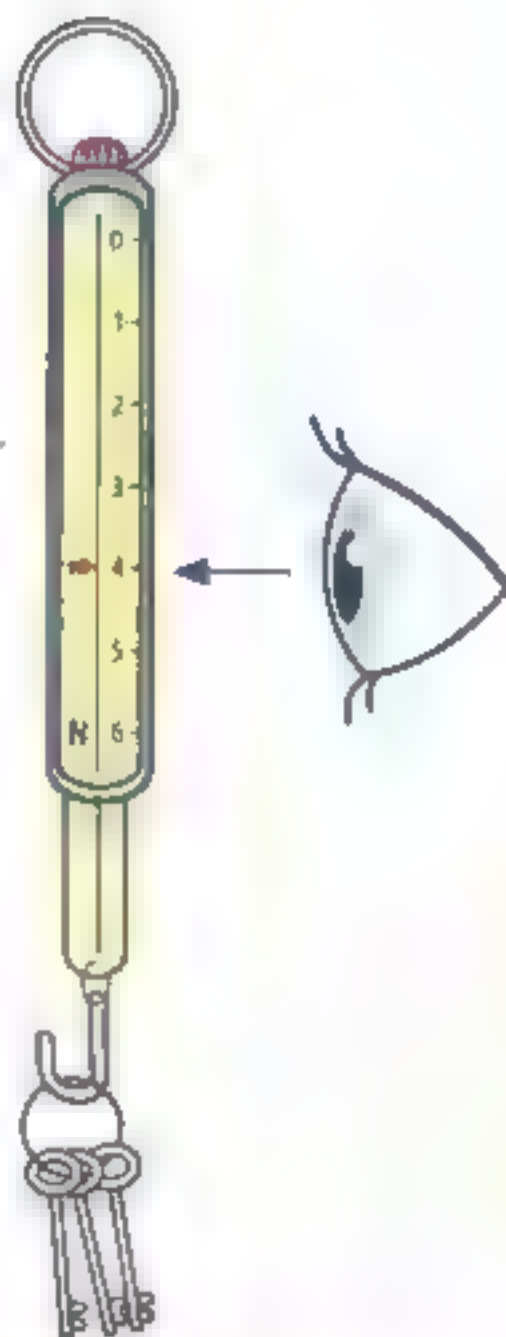
Do not hold the bulb or the thermometer will measure the temperature of your fingers





Turn the nut to check the forcemeter is set to zero

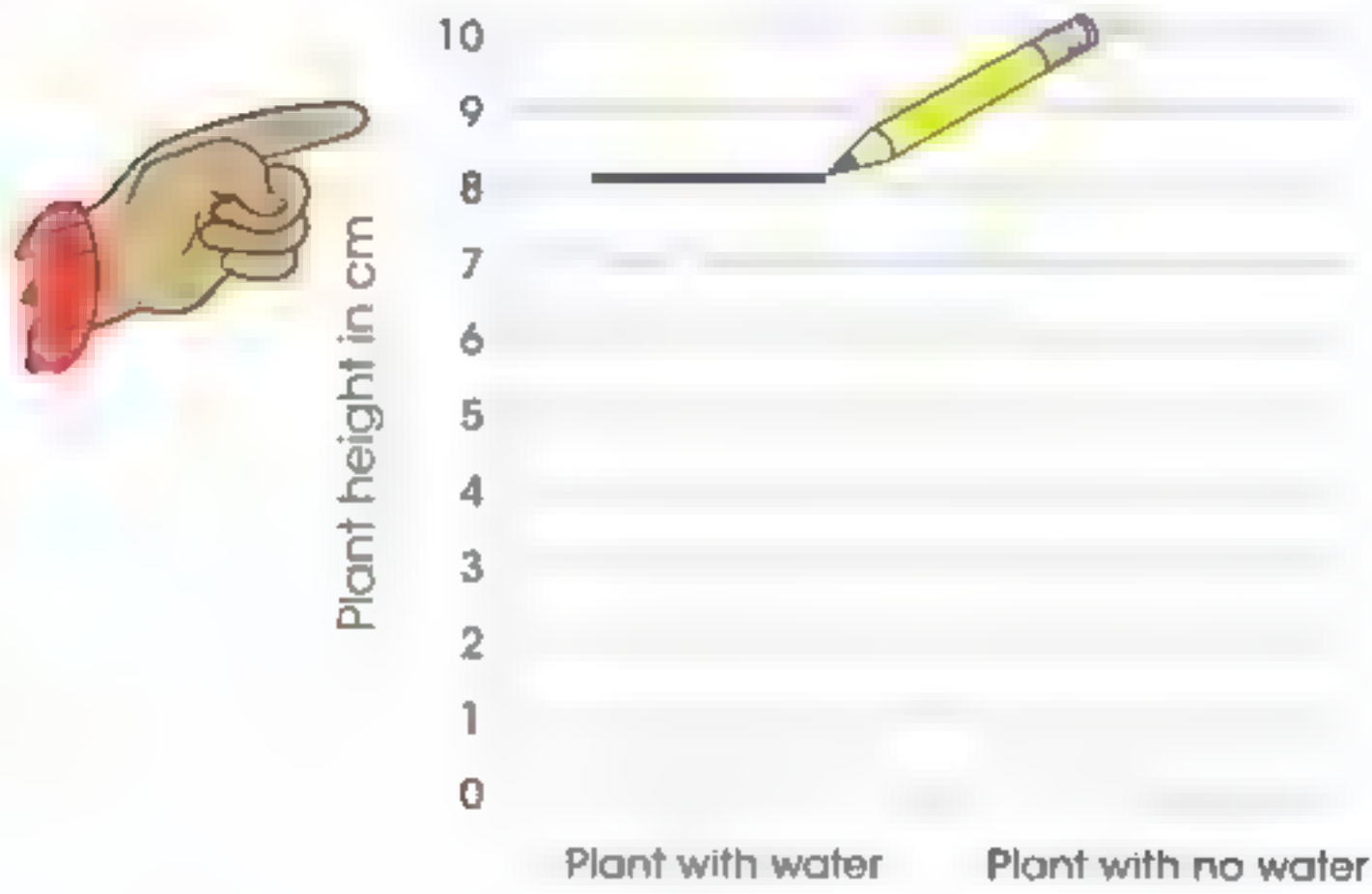
Put the object on the forcemeter.
Put your eye level with the pointer and read the scale



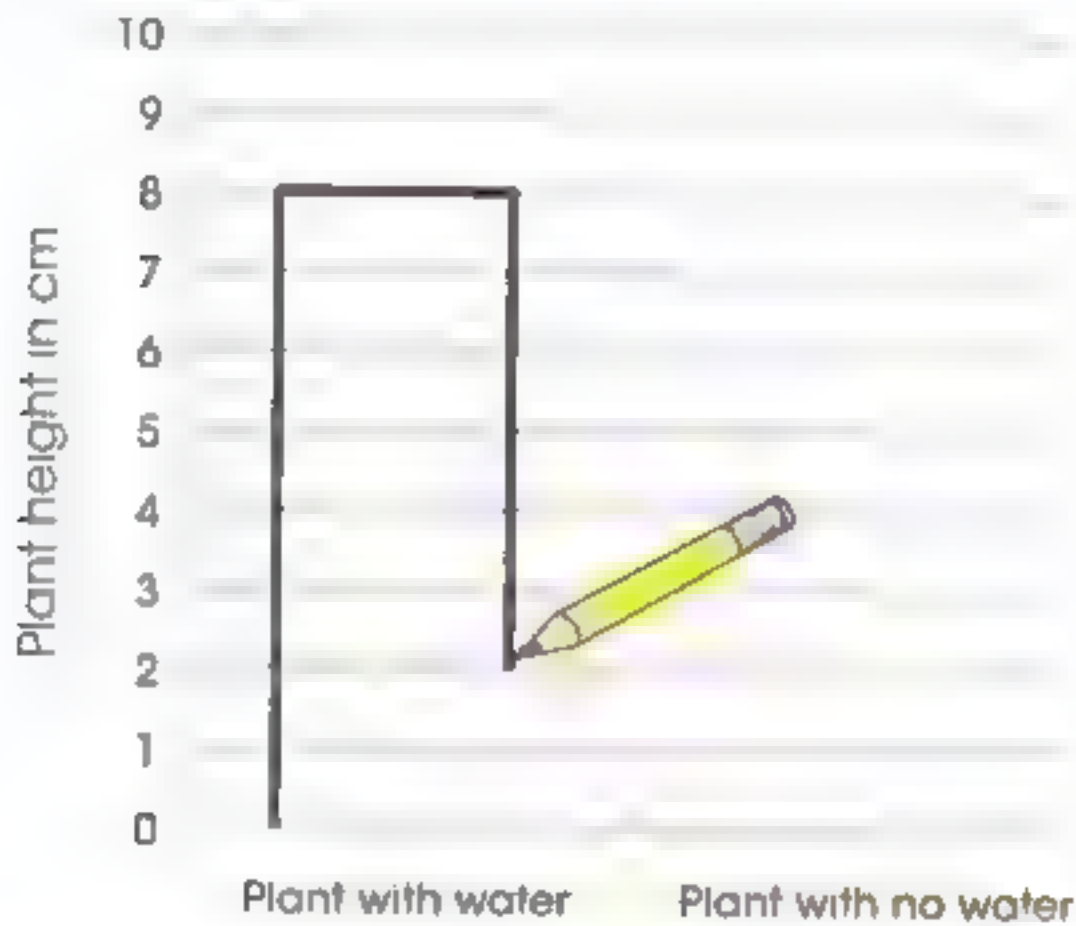
Bar Chart

Plant height with water in cm	Plant height with no water in cm
8	4

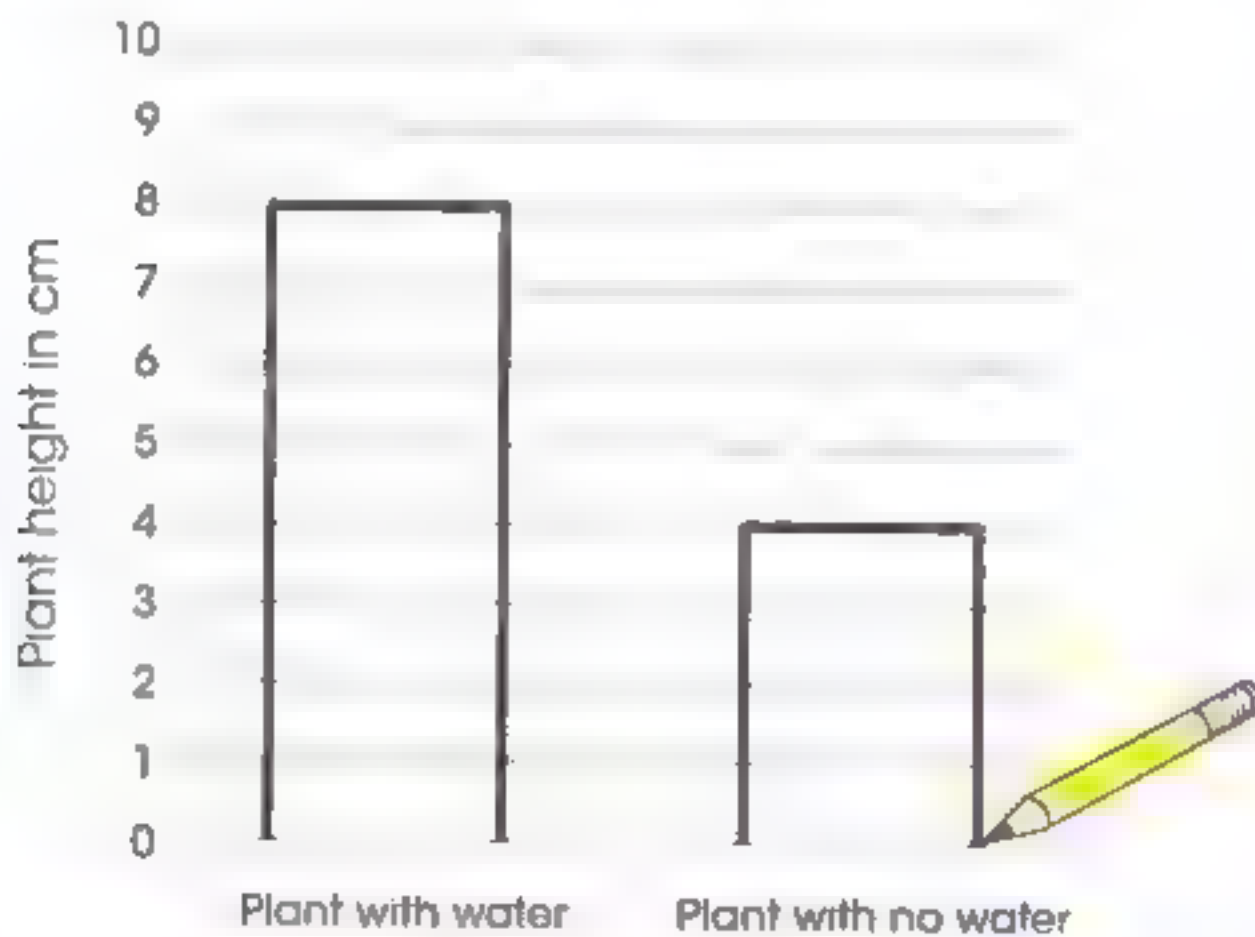
Look at the table. The numbers tell you how tall to make each bar. Draw a line at the top of the first bar. Use a ruler.



Draw the sides of the first bar Use a ruler



Draw the second bar the same way Use a ruler





		Page
absorb	to soak up liquid	10
absorbent	a material that soaks up liquid	46
adult	an animal that is fully grown	28
attract(ed)	to be pulled towards	54
bar chart	a chart that shows results using bars (the length of each bar shows the size of each result)	12
bitter	a taste that is sharp and not sweet	40
breathe	to take air in and out of your lungs	27
carbohydrate	food that gives the human body energy	16
conclusion	what you find out in an investigation	12
dairy	foods that have milk in them	16
data	information that is numbers or facts	33
dehydrated	a lack of water that is damaging to the human body	19
diet	the foods that we eat	18
different	not the same	32
direction	the line along which something moves	58



discuss	to talk about and share ideas	21
dull	something that is not shiny	48
effect	the result of something happening	60
energy	what is needed by humans to do any action	16
excrete	the life process of getting rid of waste	27
exercise	moving around so that your heart beats faster	22
explain	give reasons for	9
eyesight	the sense that uses your eyes to see	42
fair test	controlling a test by only changing one thing and keeping other things the same	8
fat	food that the human body stores	16
feed	bring food	29
fingerprint	the lines on the tip of a finger	32
fish	a source of protein	16
flexible	can be bent	46
flowers	part of the plant where seeds are made	6

force	a push, a pull or a twist	58
forcemeter	something used to measure force	64
friction	the force between two objects when they rub together	66
fruit	part of a flowering plant, some fruits can be eaten	16
get faster	to move more quickly	58
grip	to hold on to a surface	66
group	put things with other things that have similar characteristics	34
grow	to become larger and more developed	27
hard	not easy to squash, not soft	48
headache	pain that makes your head hurt	19
healthy	being well and free from disease	7
identify	to name	32
investigation	a test or experiment to find something out	8
leaves	part of the plant where the plant's food is produced	6
life processes	things that all living things do	27

magnet	an object that attracts magnetic materials	54
magnetic	a material that is attracted to a magnet	54
meat	a source of protein	16
newton (N)	the unit of force – force is measured in newtons	64
non-magnetic	a material that is not attracted to a magnet	54
nutrition	the life process of getting food for health and growth	18
observe	to look closely to find things out	60
observation	things that you notice when you look closely	51
offspring	the young of an animal	31
pattern	a link between results	55
predict	to think carefully about what might happen	8
property	what something is like, for example: a mirror is smooth and shiny	46
protein	food that the human body uses for growth and repair, for example meat and fish	16
push	to use a force to move something away from you	58

pull	to use a force to move something towards you	58
question	a sentence that states what you would like to find out	35
record	to write or draw results to show what happened	20
reproduce	the life process of having babies, laying eggs or producing seeds	31
results	the observations or measurements made in a test	12
rigid	a rigid object keeps its shape, is not easy to bend or stretch, is not flexible	46
roots	part of plant that support the plant and collect water from the soil	6
rough	feels bumpy to touch	67
salt	small white crystals with a strong taste used in cooking	21
shiny	something that light bounces off	48
similar	when things are the same in some ways but not exactly the same	32
slow down	to move more slowly	58
smooth	something that is flat, not bumpy	67

soft	a soft object is easy to squash, not hard	48
sort	to put things into groups	27
sour	a taste, for example: vinegar or lemon juice	40
start	to begin to do something	58
stem	part of plant that transports water around the plant	6
sweet	the taste of sugar or honey	40
tally	a way of counting by drawing lines in groups of five	33
temperature	how hot or cold something is	12
thermometer	an object used to measure temperature	12
tongue	part of the body you use to taste things	40
transport	to move something	6
unhealthy	being unfit, unwell, sick or poorly	7
vegetables	the part of a plant that is grown to be eaten	16
waterproof	something that water cannot get through	46
wilt	to lose shape, become limp	8
young	not fully grown	27



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3

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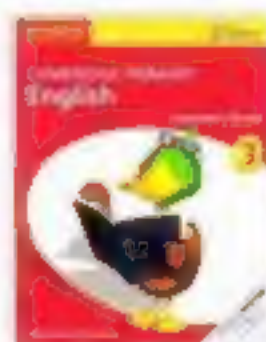
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